VOL. XXVII No. 5 SEPTEMBRE-OCTOBRE 1948

# LA REVUE AGRICOLE
DE
# L'ILE MAURICE

RÉDACTEUR : G. A. NORTH COOMBES

## SOMMAIRE



MAURICE

THE GENERAL PRINTING & STATIONERY COMPANY LIMITED
T. ESCLAPON—Administrateur
23. RUE SIR WILLIAM NEWTON

1948

## Comité de Direction

*Délégués de la Société des Chimistes et des Techniciens des Industries Agricoles de Maurice :*

MM. G. A. NORTH COOMBES
P. HALAIS
A. LECLÉZIO (Trésorier)
V. OLIVIER (Secrétaire)

*Délégués de la Chambre d'Agriculture :*

MM. J. DOGER DE SPÉVILLE (Président)
A. WIEHE

*Délégué de la Société des Éleveurs :*

HON. T. MALLAC

*Délégué du Département de l'Agriculture :*

M. W. ALLAN, O.B.E.

*Rédacteur :*

G. A. NORTH COOMBES


Les manuscrits doivent parvenir au Rédacteur, à son adresse, Vacoas, au moins deux mois avant la date de publication.

Lorsque les articles sont accompagnés de schémas, ceux-ci doivent être du même format que la revue (24 x 17 cms.) ou occuper une page pouvant être pliée dans un sens seulement.

Les demandes d'abonnement doivent être adressées au Trésorier, c/o Forges Fardieu, Ltd., Port Louis.


ABONNEMENT:

ILE MAURICE . . . Rs. 12 PAR AN
ÉTRANGER . . . . 15 " "

# NOTES ET ACTUALITES

## Position sucrière mondiale

Sous le titre " The World Sugar Situation " le S.A. Sugar Journal de mai 1948 donne un abrégé des vues de E. D. et F. Man. Si la production de sucre de betterave a été inférieure aux espérances en 1947-48, on pense qu'elle les dépassera largement cette année. Les débuts de la saison ont été particulièrement bons.

Quant au sucre de canne la production mondiale, l'année dernière, a légèrement dépassé celle de 1939-40. Pour ce qui est de la coupe en cours, l'Australie produira 700,000 tonnes, c'est-à-dire 100,000 tonnes de plus que l'année dernière. Natal, Maurice* et Cuba feront de belles récoltes, tandis que les conditions aux îles Philippines se sont encore améliorées et laissent espérer une coupe d'environ 350,000 tonnes. A Java et au Japon la production est bien en deça des chiffres d'avant-guerre.

## Les Iles Hawaï et le « Fiji Disease » de la canne à sucre

Les îles Hawaï doivent à leur position géographique isolée l'absence chez elles de certaines maladies graves affectant la canne à sucre, telle que la maladie dite de Fiji. Cet avantage que leur conférait l'isolement est maintenant compromis grâce au rapide développement de l'aéronautique commerciale. Prévenir valant mieux que guérir, les Hawaïens ont pris les devants et soumettent leurs meilleures variétés de cannes à des essais comparatifs dans des territoires où ces maladies existent afin d'étudier leur degré d'immunité et d'y créer de nouvelles variétés résistant à ces maladies. C'est ainsi qu'ils ont établi une station expérimentale à Samoa où la maladie de Fiji existe déjà. Il est à noter que les six meilleures variétés hawaïennes sont toutes susceptibles à cette maladie.

(I. S. J. — mars 1948).

## Une nouvelle méthode de « repiquage »

A la 20e réunion annuelle de l' "Associaciòn de Técnicos Azucareros de Cuba ", C.E. Beauchamp a décrit un nouveau moyen de repiquer les champs de cannes qu'il a désigné du nom de " *Integral Method.*" Cela consiste à faire, avec une barre à mine, un trou de 3 pouces de diamètre

* On estime la récolte de l'île Maurice à 384,000 tonnes.

et de 10 à 12 pouces de profondeur dans lequel on enfonce par le bout inférieur une canne entière munie de ses feuilles de sorte que les trois ou quatre premiers oeilletons sont au-dessous de la surface du sol. On tasse alors fermement la terre autour de la tige. L'on assure de cette manière la présence d'un œilleton à différentes profondeurs et l'on ne se soucie plus de la variation dans la teneur en humidité des diverses couches de la terre arable, l'œilleton à proximité de l'humidité optima étant sûr de germer. Cette façon d'opérer s'est révélée supérieure aux méthodes adoptées jusqu'ici à Cuba pour le repiquage. Il est à noter qu'une de ces méthodes, l'emploi de " fausses dents ", est identique à celle en usage à Maurice.

(I. S. J. — avril 1948.)

---

## Progrès réalisés à Cuba dans le contrôle biologique du borer de la canne à sucre

Dans un article publié dans " Proc. 20th. Ann. Meeting Asoc. Tecn. Azuc. de Cuba," 1946, L. C. Scaramuzza et J.F. Pérez exposent les résultats obtenus par le contrôle biologique du borer à la Campania Azucarera Atlantica del Golfo où deux laboratoires furent créés en 1945 et 1946 dans le but de multiplier le parasite *Lixophaga diatraea*. Les auteurs comparent les résultats obtenus en 1946 avec ceux de 1945. Sur une des propriétés de la compagnie les chiffres de juillet 1945 sont comparés à ceux de mai 1946 : rejets morts 8,435 avec 1,562 borers, en 1945 ; en 1946, rejets morts 2,976 avec 593 borers. Le pourcentage de parasitisme était 0 en 1945 et 57.2 en 1946. On n'est pas encore en mesure de citer des chiffres comparables pour le 2nd établissement, mais l'intensité de parasitisme passa de 8.3 pour cent en 1945 à 35.0 en 1946. En 1946 pas moins de 37,000 *Lixophaga* furent libérés ; c'est le nombre le plus élevé de ce parasite libéré jusqu'ici dans un pays producteur de cannes à sucre.

(I. S. J. — mai 1948)

---

## Consommation du thé aux Etats-Unis

Malgré une forte réduction dans les importations, la consommation du thé aux Etats-Unis a dépassé en 1947 tous les chiffres des années précédentes. Elle s'est élevée, en effet, à 85.699.000 livres contre 76.160.000 livres en 1946. La consommation par tête d'habitant a été, en 1947, de 271 g. contre 250 g. en 1946. La moyenne annuelle d'avant-guerre était de 317 grammes.

(Chimie et Industrie — mai 1948)

## Production of More Food from the Soil

From soils which contain fair quantities of organic matter and in the cultivation of which water is not a limiting factor, C.R. Harihara Iyer and Dr. V. Subhrahmanyan, of the Indian Institute of Science, Bangalore, have been able to obtain spectacular increases in crop yields, according to an account of their experiments appearing in " Indian Farming " of November, 1946. Some ten years ago these workers and C.R. Rajagopalan reported that the normal soil processes leading to release of plant food from manures and other residues of the soil could be hastened by treatment with certain chemical agents applied in relatively small quantities. Microbial life was stimulated, oxidation of organic matter was hastened and plant foods were released for utilization by the growing crop. As a result, an increase of 25 per cent of the yield could be expected in most cases. The findings were confirmed in other parts of the world and the principle has been established that the soil can be " catalysed " to yield more abundantly. The authors' earlier experiments were conducted with permanganate of potash and also with iron and manganese oxides. Later, they showed that similar effects were produced by soluble salts of iron and manganese. The salts were, however, not easy to apply directly to the soil and it was difficult to obtain a uniform beneficial effect ; accordingly, the " catalyst " was mixed with some organic manure prior to application. For the past two years, Iyer and Subrahmanyan have systematically studied the practical aspects of this type of treatment and have found that a very small quantity of 14 lb. of manganous or iron sulphate per acre were sufficient to produce a 25 per cent increase in yield of different types of crops. Further extended trials, under different soil and climatic conditions, are needed before the practical possibilities of the treatment can be definitely established.

## Production laitière

D'après un rapport de Zurich, le seul pays au monde où le volume de la production laitière totale est en progression par rapport à 1940, est la République Argentine. Partout ailleurs, la production est en grande partie régressive. C'est en France que cette régression serait le plus marquée. Dans l ensemble des pays du monde, le travailleur tend à améliorer sa situation (repos, congés, etc.,). Or, la production laitière nécessitant un travail de tous les jours est en contradiction avec la nécessité de ce progrès social. Dans tous les pays du monde les autres produits ont tendance à augmenter en volume par suite de la mécanisation, de la motoculture et de techniques améliorées. La régression en France de la production laitière, dans les régions de grande culture, tend à imposer (N. de la R. comme à l'île Maurice, d'ailleurs) un monopole de fait qui deviendra un jour un monopole total : seule la petite culture produira du lait. Les efforts constructifs doivent viser à améliorer la quantité et la

qualité du lait. L'amélioration des races françaises est en voie de réalisation par l'insémination artificielle que l'on est en train de développer au maximum. Il y a quelques mois un seul centre officiel d'insémination existait, inséminant 3.000 vaches seulement. Depuis le début de l'année, plus de 150.000 vaches étaient inséminées et beaucoup de coopératives d'insémination étaient en constitution. On prévoit, pour la fin de l'année, que 250,000 vaches auront été ainsi inséminées. (L. Biset, président de la F.N.P.L., dans " Libération Paysanne " du 19 février 1948).

---

## « A Food-Plant Catalogue of the Insects of Mauritius »

Mr. Raymond Mamet, Acting Assistant Entomologist of the Department of Agriculture, is the author of Bulletin No 30, Scientific Series, which bears the above title.

During the past fifty years more accurate knowledge of the insect fauna of Mauritius has been accumulating ; it is now emerging from its previous obscurity. While the present catalogue cannot be complete for many years to come (the author proposes to publish additions to it from time to time) it will be of great value to botanists, entomologists, agriculturists and others as a work of reference. The plants listed are arranged in alphabetical order by their scientific names and a list is given of the vernacular equivalents, which will extend the use of the catalogue to a number of lay workers, especially in Mauritius.

---

## Une victoire de l'Institut Pasteur d'Alger sur le paludisme

Résultats remarquables d'une expérience d'assèchement et de mise en culture d'un marais algérien, sans risque de contamination palustre.

Cette expérience s'est déroulée, à partir de 1927, sur un vaste marécage de 360 ha., que les hommes fuyaient par crainte du paludisme et d'où ils écartaient leurs troupeaux par peur des piroplasmoses, maladie transmise aux bovidés par les tiques.

L'indice splénique des populations voisines de ce marais était de 53% (seuil de danger : 10 o/o).

De la quinine fut distribuée tous les trois jours, et, en quelques années, l'indice descendit de 53 o/o à 6 o/o environ. Le niveau du facteur " porteurs de germes " avait été ainsi au-dessous du seuil de danger.

L'anophèle, transmetteur de germes, a été éliminé par colmatage de creux de stagnation, réalisé par le dépôt forcé des alluvions, que les eaux torrentielles arrachaient aux montagnes voisines.

L'eau impossible à supprimer fut peuplée de gambouses (*Gambusia*), petits poissons vivipares et prolifiques, originaires du Texas, qui sont de gros mangeurs de larves de moustiques.

Dans les bas-fonds, qui sont les plus difficiles à drainer, plus de 45,000 arbres furent plantés, surtout des *Eucalyptus algerensis*, véritables pompes vivantes.

En 1946, 163 ha. ont été ensemencés de céréales et 40 de plantes fourragères. Personne n'a contracté le paludisme et des vaches laitières vaccinées contre les piroplasmoses, pacagent là où naguère on n'aurait osé mener les bœufs de labour.

(Agronomie Tropicale — mars-avril 1948)

## Rationalisation agricole suisse

M. le professeur Howald, secrétaire général de l'Union Suisse des Paysans, a exposé récemment, à l'Institut des Hautes Etudes Agraires, l'esprit et le résultat des recherches auxquelles se sont livrés depuis de longues années les spécialistes de l'économie rurale en Suisse.

Après avoir noté que les exploitations agricoles suisses sont avant tout, petites et moyennes, M. Howald, s'appuyant sur le contrôle exercé dans une quinzaine d'entre elles (grandes, moyennes ou petites) a relaté les résultats suivants :

Exprimée en heures et par hectare sans les forêts, la somme de travail humain exécutée dans l'exploitation paysanne suisse varie fortement suivant les différentes conditions. On compte 2.500 à 3.000 heures dans les petites exploitations (c'est-à-dire celles allant jusqu'à dix hectares), 2.000 à 2.500 dans celles d'étendue moyenne de dix à vingt hectares. Ces chiffres tombent à 1.500-1.600 dans les propriétés plus importantes de vingt à vingt-cinq hectares. 54 o/o environ de la totalité des heures de travail humain fournies dans l'agriculture suisse concernent les travaux d'intérieur (effectués dans le ménage, les étables et la ferme), 40 o/o seulement sont consacrés aux travaux des champs.

Le nombre moyen des heures de travail (par travailleur) atteint en grande moyenne un chiffre annuel de 3.500 heures, soit près de 11 heures par jour. Pendant les mois d'hiver, la journée de travail est de dix heures et durant ceux d'été, de douze heures en moyenne, et, à l'occasion, quinze et plus. La paysanne est, en général, soumise à une contribution dépassant la moyenne. Dans ces conditions, note M. Howald, l'agriculteur du régime de la petite et de la moyenne propriété est contraint de rationaliser son travail pour accroître l'efficacité de l'homme et du matériel. Le succès le plus tangible de la rationalisation du travail agricole réside dans l'intervention du moteur et de la machine. La Suisse est, à cet égard, le pays

peut-être " le plus motorisé du monde " en regard de sa superficie avec 14.000 tracteurs de poids moyen, 4.000 motoculteurs et 5.000 treuils motorisés. Par mille hectares, on compte environ 35 machines à moteur contre 13 aux Etats-Unis.

En ce qui concerne l'ensemble des travaux de la ferme, la rationalisation permet d'obtenir une économie de temps égale à un tiers pour les cultures fourragères, 53 o/o pour la pomme de terre. Ainsi le nombre des heures de travail s'élève, dans une exploitation travaillant rationellement, à moins de la moitié de ce qui est effectué dans les autres. Il existe en matière d'économie du travail de grandes possibilités.

(Libération Paysanne — 8 avril 1948).

## Development of New Disease-Resistant Tobacco Varieties in U.S.A.

An outstanding new variety of flue-cured tobacco, Oxford 26, is described in the *Yearbook of Agriculture-Science in Farming*, recently issued by the United States Department of Agriculture. It is said to be the first commercial variety that withstands bacterial wilt. It is a result of a world-wide search begun in 1934 to find wilt resistance. T.I. 448, a vigorous type that produced cured leaf of fair colour and had no distinctly objectionable qualities, found in Colombia, was crossed with susceptible flue-cured varieties including 400 (a selection made in the Old Belt area). From these crosses a selection was made that possessed the full resistance of T.I. 448 and had excellent flue-cured quality. Named Oxford 26 it is outstanding for the uniformity of its cured leaf colour and has an oiliness and elasticity that appeal strongly to buyers. Many experts think it has better smoking quality than any of the common varieties. Oxford 26 proves that it is possible to combine improved quality with improved disease resistance.

(The Empire Producer — Mch-Apr, 1948).

## Twenty-five Years of Forestry Work on the Island of Hawaii

In an article published in " Hawaiian Planters' Record, " 1947, L.W. Bryan gives an account of the afforestation work conducted in Hawaii during the latter 25 years. One of the major problems involved was the determination of the species best adapted to the wide range of conditions varying from sea level to over 6000 feet and a rainfall from 7.5 to 287 inches. No less than 60 pages of the article are devoted to a list of the trees tested in experimental planting and to giving their reaction under different conditions of altitude, while, in a further list, a wide range of fruit trees is similarly discussed. The former list particularly is a very valuable contribution for guidance in work of a similar nature undertaken elsewhere under comparable conditions.

(I. S. J. — May, 1948).

# A PRELIMINARY ACCOUNT OF THE PROJECT FOR THE CONTROL OF *Cordia macrostachya* (Jacq.) Roem. & Schult, (Herbe Condé), IN MAURITIUS

J. R. WILLIAMS, B. Sc., D. I. C., F.R.E.S.
Entomologist, Department of Agriculture.

## Contents



Owing to the importance attached to the eradication of the weed *Cordia macrostachya* (Jacq.) Roem. and Schult (Boraginaceae), known locally as Herbe Condé, and to the widespread interest shown in the course of the control measures which are being taken, the following account has been prepared. Its primary object is to inform those most concerned with the losses resulting from *Cordia*, the members of the planting community, of the progress of this work to date, and of the principles involved in the methods used.

All phases of the work cannot yet be recounted with detail, as much of it is carried out in Trinidad ; moreover, it is still proceeding, so it is premature to draw conclusions as to the degree of success which can be expected. It is desirable however, to publicise the progress of this work for the information of the public. Technical descriptions and details have accordingly been reduced to a minimum.

Much of the information contained here has been extracted from the files of the Department of Agriculture, and is the result of the combined efforts of the members of the Entomological Division. Information has also been acquired from various reports from Trinidad ; various other sources of information have also been utilized ; all of which are acknowledged in the bibliography.

## Introduction

The suitability of conditions in Mauritius for the growth and propagation of *Cordia macrostachya,* a hardy perennial shrub, led to its rapid spread after its introduction in the latter years of the 19th century, until it became imperative that some degree of permanent control be effected. To this end a scheme was prepared by the Department of Agriculture in 1939. The advent of war caused its postponement, but in 1942 it was revived, and the first practical step was taken by the allocation of £ 1,000 to be spent on research into the status of *Cordia,* with regard to its insect enemies, in the countries where it occurs naturally i.e. in the Caribbean region. To do so the assistance of the Imperial College of Tropical Agriculture in Trinidad was sought.

The preliminary phase of this work, concerning the status of *Cordia* in the West Indies and in Mauritius, chiefly from the botanical and ecological aspect has been given by Wiehe (9). The history and spread of *Cordia* in Mauritius, from its introduction in 1890 in a cane consignment from British Guiana, to its present day abundance, is also related in this paper.

Briefly, the profligate growth of *Cordia* in Mauritius is attributed to the following :—

### *1. The suitability of the climate.*

It is only at an altitude of 1,500 feet and over that climatic factors exert any inhibitory influence on *Cordia.* At these high altitudes, where rainfall is higher and temperature lower, growth is not sufficiently vigorous to enable *Cordia* to become the dominant plant species. In conjunction with this climatic factor, competion with other well established species such as *Ligustrum walkeri* Decne (Privet), *Psidium cattleianum* Sab. (Goyave de Chine), and *Rubus roridus* Lindl. (Framboise marrone) appears to be more acute than in the lower altitudes where the flora is different.

Climate is not restrictive below about 1,500 feet, and the competitive potential of this lowland flora is constantly being reduced, since it is largely composed of *Furcroea gigantea* Vent. (Aloes), and *Leucoena glauca* Benth. (Acacia) which are exploited as profitable plants.

### 2. *The dispersal of seeds by birds.*

*Cordia* reproduces entirely by seed. The following birds are known to be active in their dispersion, the berries being eaten and the seeds passing unharmed through the alimentary tract :—

*Pycnotus jocosus* L. (" Bul Bul " or " Oiseau Condé ")

*Archidoteres tristis* L. (" Martin " or " Minah Bird ")

*Geopelia striata* L. (" Petite Tourterelle ")

*Tutur chinensis* Scopoli (" Grosse Tourterelle ")

The " Bul Bul " was accidentally released in Mauritius in 1892 when an aviary was smashed in a cyclone (?). at Moka. It originates from Madagascar. The " Martin " was brought from India in 1762.

### 3. *The absence in Mauritius of Cordia's natural enemies.*

In the West Indies a large number of insects is associated with *Cordia*, excluding those casual visitors such as Bees and other Hymenoptera which feed on the nectar of the flowers. Donald (1) and Kirby and Adamson (3) found 22 species which feed on the inflorescences, flowers, and fruits, 10 which feed on the leaves, and 4 which feed on the stems of the *Cordia*.

In Mauritius only 5 species were reported by Wiehe (9) to feed on *Cordia*. This list may be extented (4), viz :—

*Brenthia leptoscoma* Meyr. (Glyphipterygidæ) —
*Cratopus* (?) *brachialis* Boh. (Curculionidæ) — } on leaves
*Acherontia atropos* L. (Sphingidæ) —

*Aphis gossypii* Glov. (Aphididae) — On young shoots.

*Haplothrips gowderyi* Frank. (Phlœothripidæ) — in flowers

*Howardia biclavis* (Comst.) (Diaspididæ) —
*Pinnaspis strachani* (Cooley) (Diaspididæ) —
*Flatopsis nivea* Sign. (Fulgoridæ) — } on twigs.
*Icerya seychellarum* Westw. (Coccoidea) —
*Saissetia hemisphaerica* Targ. (Coccoidea) —
*Hemiberlesia lataniae* Sign. (Coccoidea) —

Only *Brenthia leptoscoma* does any appreciable damage, unlike the others, this insect is now found only on *Cordia*. In some localities there is almost 10 % attack of the leaves, and this must indoubtedly have some, if only slight, effect on the vigour of the plants in these localities.

The remaining species are either rare, or they only occasionally feed on *Cordia*, consequently they are of no value whatsoever.

It was found by Wiehe that the percentage of flowers developing into fruits is much lower in Trinidad than in Mauritius. Also the number of seeds which fail to germinate is higher. This discrepancy of the

fecundicity of *Cordia* in Mauritius and in Trinidad is undoubtedly due to the comparative absence of insects injurious to the plant in Mauritius. Mummified fruits and traces of insect damage to inflorescences, flowers, and fruits, are common in Trinidad, while in Mauritius the production of viable seeds is apparently unchecked.

It must be concluded that in the West Indies, the collective action of the insect fauna is the chief restrictive agent resulting in the equable position of *Cordia* as a subordinate species of no economic concern.

These are the facts which led to the decision to introduce into Mauritius the insects which live upon *Cordia* in its natural home, in an attempt to achieve a biological control.

## The biological control of weeds

Plant pests, or weeds, can be controlled by several methods, the most common being the mechanical one of cultivation. This method suffices when the weed is indigenous and is therefore also subjected to the natural equilibrating effect of the fauna and flora. When a plant is introduced into an insular country where the wealth of species, both plant and animal, is not that of a continental zone, the buffering effect of the environment is often insufficient to curb it, and the plant flourishes to a degree out of all proportion to that which it does in its country of origin. Such is the position with *Cordia* in Mauritius. Biological means of control, involving the introduction of the plants' natural enemies, are theoretically the most logical to apply in order to restore the balance. Such control methods, if successful, would be permanent, and apart from a high initial expenditure and effort, would not need further attention.

However, the risk involved by the lack of adequate knowledge of the biology of many insect species, is often so great that biological control has many dangers. Even when the behaviour of an insect species is well known, some influence of climate in its new habitat may cause its value as a controlling factor to depreciate, either by reducing its vitality, or on the other hand cause its habits to change and the species become harmful rather than beneficial to man. The latter consideration is of sufficient magnitude to make control by biological means a last resort. Whenever other methods can suffice, they should be used.

Mauritius has suffered much from the indiscriminate introduction of plant and animal species in the past. *Cordia* itself is the outstanding example, also *Clemora smithi* (Arrow), (White grub of sugarcane), and the Sugarcane borers. There are many others which were either deliberately introduced in ignorance of their potentialities, or which were allowed to enter by the absence of the necessary restricting legislation to enable the examination and destruction, if necessary, of imported materials at the Customs.

There is no need to emphasize further the dangers involved in the introduction of new species to Mauritius. If such a course of action is

really necessary, as it is in the case of *Cordia* control, then certain precautionary measures must be taken.

## Precautionary measures

The risk taken in introducing a new insect is dependent upon (a) the specificity of that insect to its food material, or, as is the case with true parasites, to the specialisation in its choice of hosts as a site for reproduction, and (b) to the botanical position of the weed in question.

The more highly specialised is the insect to a particular way of life, then the less probable it is that it will change its habits when introduced to a new environment. Its behaviour is more predictable.

An insect which does not appear to be specific to a food plant in the field must never, therefore, be selected for introduction to another country for purposes of biological control. Once an insect has been selected by virtue of its apparent specificity in the field, feeding tests must be carried out and repeated in the country into which it is intented to introduce the insect. If the insect in question is a leaf feeder, then all the plants of economic importance in that country should be offered as food material, each plant species seperately. If the insect starves to death on all economic plants of value, its specificity may be regarded as of such a high value that it may be liberated with safety. If the insect is, for example, a seed parasite, then its specificity need only be tested with different plant seeds of a similar structure.

The botanical position of the weed in question is also an important consideration. If the weed species has members of the same genus (i.e. plants of similar nature) which are cultivated as crop plants, then the specificity of habits demanded of the insect must be higher. There is always the possibility that in a new country, insects which normally attack only one plant species will extend their scope and also attack related species ; these may be crop plants. On the other hand, if the weed belongs to a group of plants none of which are cultivated or considered of value, then the specificity of habits demanded of the insect is less, because the plants to which it may extend its attacks will most probably not be of economic value.

How does *Cordia macrostachya* stand in this respect ?

Fortunately it is a member of the family Boraginaceae none of whose members are cultivated as crops in Mauritius. Therefore if an insect is imported which has a tendency to attack other species of plants in this family, it is of no concern.

## Considerations in the selection of a benefical insect

Apart from the above-mentioned specificity, there are several other factors to be considered.

It is not necessary to select an insect which does a considerable amount of damage in its natural home, for insects are themselves restricted by their own parasites. In other words, an insect which is introduced, in the present instance to control *Cordia*, need not be one which inflicts great damage to it in the West Indies, provided that it is possible to introduce it free of its parasites. An insect thus freed of its own restricting agents and finding an excess of its host plant, as it would in Mauritius, will be able to feed and reproduce without hindrance, *providing* that it is adaptable to its new climatic conditions, and that there are no species of insects in its new environment which are capable of parasitising it or inhibiting it to any great extent.

Another consideration, but of lesser importance, is the facility with which the insect to be introduced can be reared in the laboratory. It is always desirable to liberate a new species in large numbers ; moreover, considerable numbers may be needed for testing purposes prior to its proposed release. It is therefore a practical advantage to obtain an insect which is not difficult to breed.

## Preliminary work in Trinidad

Before taking concrete action it was necessary to appoint an experienced entomologist to Trinidad to devote himself to the work. To do so, the services of the Imperial Parasite Bureau were sought, and through this organization Dr. F. J. SIMMONDS was appointed this task. Owing to the scarcity of trained entomologists and to other difficulties, it was not until 1946 that Dr. Simmonds was able to begin his work. In the meantime, however, valuable progress had been made by Mr. I. E. Kirby and Mr R. G. Donald working under the supervision of the late Professor A. M. Adamson and Dr. E. M. Mc Callan ; while in 1945 Mr. P. O. Wiehe of the Department of Agriculture, Mauritius, visited Trinidad and other islands of the West Indies, to study and compare the ecological position of *Cordia* in those islands and in Mauritius.

The number of insects associated with *Cordia* was found to be considerable (a list compiled by Donald is given in Wiehe's paper). Many of these insects were difficult to identify, and it was later discovered that many of them were new species. Practically nothing was known of their biology, apart from the type of damage which they inflicted upon *Cordia*.

Donald and Kirby began the investigation of *Cordia* insects in Trinidad with the species *Physonota alutacea* Boh. (Cassididæ) and *Schematiza cordiæ* Barb. (Galerucidæ), both leaf-eating insects, so that when Dr. Simmonds commenced his work in 1946, these were the only insects about which fairly adequate information was available.

Many of the *Cordia* attacking insects were obviously polyphagous (i.e. would feed on a variety of plant species) and could at once be eliminated. While work on seed and flower destroying insects was initiated, the desirability of introducing *Physonota* and *Schematiza* into Mauritius

was considered. These two insects have since been liberated in Mauritius, and it is proposed to deal fully with them with regard to the principles and methods of procedure which have already been outlined.

## The Biology of *Physonota* and *Schematiza* in Trinidad

*Physonota alutacea* Boh. (Cassididæ)

The full account of the biology of this species in its natural home cannot be given here, but the salient features — from the aspect of its use as a Cordia controlling agent — may be enumerated as follows (Reports of Dr. F. J. Simmonds, also papers of Donald (1) and Kirby and Adamson (3) :—

a) Parasitism by other insects

The parasitism of *Physonota* eggs was found to be high, two species of Chalcids being involved *Horismenus* sp., and *Syntomosphyrum* sp., the former being about 8 times more abundant than the latter, and between them parasitising and killing about 70-95% of the eggs.

The larvae are also parasitised sometimes to an extent of approximately 50%. The parasites have not yet been all identified but they are known to include the Tachinid *Euclatoriopsis* sp. A Chalcid parasite (unidentified) has also been found in a *Physonota* pupa.

Thus parasites are extremely important in limiting the numbers of *Physonota* in Trinidad. This factor would be removed in Mauritius, enhancing a higher survival rate of the eggs and subsequent developmental stages prior to the adult stage.

b) Predators.

The wasp *Polistes canadensis* L. was found to carry off a number of the larger larvae. An unidentified species of ant also attacks 1st stage larvae and also pupae, a hole being made in the skin of the latter and the contents cleaned out.

c) Distribution.

The distribution of *Physonota* in Trinidad is very restricted, it being found in one locality only. All attempts to establish it in other parts of Trinidad have failed ; it is thought that this is due to the ants previously mentioned (b).

d) Reproductive capacity.

The adult insects are free of parasites and their life is long. Individuals have been known to live for 3 months, sometimes more, and the number of eggs laid by a female in that time is approximately 1,000.

(e) Specificity to food material.

Altogether 117 plants of Trinidad were tested as food material for *Physonota*, not only with adult insects but in addition with various larval stages.

Only two of these plant species other than *C. macrostachya* were

eaten by Physonota. *Cordia colococca* leaves were nibbled by all stages tested, and also leaves of *C. lockhartii*.

Development could not be completed on either. Specifity appears therefore to be very high.

The high incidence of parasitism in Trinidad, the specificity to its food material, and the fecundity of the adults, are the favourable features of this species. On the other hand, its limited distribution in its native country indicates a vulnerability, perhaps not only due to predators, but also to climate.

*Schematiza cordiae Barb.* (Galerucidae)

(a) Parasitism by other insects.

Egg parasitism is high, a minimum and maximum of 75% and 95 o/o respectively being recorded. The parasite is *Tetrastichus* n. sp. (Eulophidae).

In addition the larvae are attacked by *Chaetonoxdexodes marshalli* Ald. (Tachinidae) to an extent of approximately 83 o/o in 3rd stage larvae.

(b) Distribution.

*Schematiza* is very widespread in Trinidad, although its numbers are not large, which may be accounted for by the high total parasitism.

(c) Reproductive capacity.

As with *Physonota* it is high. One pair may produce approximately 1,000 eggs.

(d) Specificity to food material.

A series of feeding tests similar to those carried out with Physonota showed the specificity to be pronounced.

From this work in Trinidad, the status of *Schematiza* as a possible controlling agent of *Cordia* seems similar to that of *Physonota*, except that its wider distribution indicates a greater resistance to adverse environmental factors, increasing the probability of its successful establishment in Mauritius.

## The advisability of introducing leaf feeding insects

*Cordia* reproduces wholly by seed production. It may therefore be asked why two leaf destroying species have been considered as controlling agents. Defoliation, however, inevitably reduces the vigour of a plant, and the question was not if they would be effective in reducing the reproductive capacity of *Cordia*, but whether their effect in this respect would be sufficient to warrant the work and expense of introducing them.

The effect of defoliation on the seed producing capacity of *Cordia* was illustrated by an experiment performed by Mc Callan (5) in Trinidad. Plants were defoliated by hand, and their fruit production compared with normal plants. It was concluded that defoliation has a pronounced effect.

*Cordia* is, however, a very resistant plant, and it could not be assured that these two insects are capable of the considerable defoliation which is necessary to produce a reduction in seed production. It has previously been mentioned that biological control depends upon the prodigious increase in the numbers of the introduced insect, owing to the absence of its parasites and to the excessive abundance of the host plant in its new environment. If this rapid multiplication does not occur in Mauritius, owing to some climatic or faunistic influence, then these two species cannot be expected by themselves to exert any considerable effect in the control of *Cordia*. The presence of a restrictive agent to their multiplication cannot be accurately anticipated, and this is one of the main failings on this method of control. All that can be ensured is that the insects are introduced free of their natural parasites.

An experiment by Simmonds (8) has illustrated the damage which *Schematiza* is capable of inflicting upon *Cordia* when it is freed of its parasites and can therefore multiply without restriction. Parasite free *Schematiza* were placed on a *Cordia* bush and the bush covered with cheese-cloth to prevent the interference of parasites. Other bushes were covered with netting which allowed parasites to enter. In 3 weeks the plants under the cheese cloth had been completely defoliated, while those under the large-meshed netting were healthy owing to the entry of parasites which prevented the rapid multiplication of *Schematiza*.

Thus, if *Physonota* and *Schematiza* will defoliate to a considerable extent in Mauritius, their value will be unquestionable. But it must be borne in mind that adequate control is not *anticipated* by the use of these insects alone. *Cordia* attacking insects of various kinds i.e. seed parasites, flower feeders, etc. will eventually be liberated also when sufficient has been learned about the biology of such insects, so that the plants will, if the various species succeed in establishing themselves, be attacked in many ways. The net result is anticipated to be a reduction in the reproductive capacity of *Cordia* of sufficient magnitude to justify its clearance by hand.

Since the elucidation of the biology of seed and flower infesting insects is a longer process, owing to the intricacies of the habits of such insects, it was decided to proceed with the introduction of *Physonota* and *Schematiza* while work on these insects was progressing.

Accordingly a technique of shipping live insects to Mauritius was worked out, all precautions being taken first to exclude their West Indian parasites.

## *Physonota* and *Schematiza* in Mauritius

### (a) *Physonota alutacea* Boh.

The first shipment was received on the 26th February 1947. Out of 50 adults sent, 29 were received alive. Breeding was commenced with these individuals. A subsequent 7 shipments enlarged the stock for bree-

ding, and brought the total of living *Physonota* received in Mauritius to 209.

Early difficulties of breeding technique were soon overcome, and the laboratory-reared population was soon of sufficient size to commence feeding tests on plants of economic importance. The handling of *Physonota* was under strict quarantine conditions pending confirmation of its specificity.

A series of feeding tests on a total of 88 plants of economic importance was carried out (6, 7) (Table I). It was found that apart from *C. macrostachya*, *Physonota* would feed only on *C. abyssinica*, *C. myxa* and *Erhetia acuminata*, all members of the Boraginaceæ, while only on the first two could it develop normally. On *E. acuminata* death invariably occurred after about 10 days.

*Physonota* is thus entirely restricted to plants of the genus *Cordia*, and the decision to commence large scale breeding for its liberation was accordingly taken.

Liberations were commenced on 11.7.47 and continued until 25.5.48, a grand total of 21,000 adults, 4,000 larvæ and 7,000 eggs (280 egg batches) being released in 44 localities.

The size of batches released in 1947 numbered in individuals between 50-250 (adults), and 100-500 (larvæ), and 50-1,250 (eggs), sometimes eggs, larvæ, and adults being liberated at the same time. During 1948, batches released have always been of at least 1,000 adults, the maximum released at one time being 4,000.

*Physonota* has now been released in every conceivable environmentally distinct locality in Mauritius, from the very hot and dry coastal regions to the cooler and wetter highlands, involving a temperature range of 77-67.5°F., and a humidity range of 65 o/o-89 o/o (the figures are annual means). The rainfall ranges similarly from 45 to 126 inches.

Localities in which liberation has been carried out are visited as frequently as is possible. The adults are not active and can usually be found many weeks later on the same bushes on which they were placed at liberation. In one locality in the uplands, with an altitude of approximately 1,000 feet, (Melrose), adults have been observed up to 3 months later, still copulating and egg laying. Egg batches were repeatedly found but only on 3 occasions were 1st stage larvae seen. Later stages of the larval life were not seen, and there is no doubt that the adults mentioned above were some of those originally released and not their progeny.

In the coastal districts no egg batches or larvae have been observed and only on one occasion was a copulating pair found.

At an intermediate locality of approximately 650 feet, (Sorèze), some eggs and a few 1st stage larvae were found.

It is now (August 1948) over a year since the first liberations and there is still no evidence that *Physonota* can complete its development under field conditions in Mauritius. It must therefore be concluded that

Mauritian conditions are not suitable for this insect, and that as a controlling agent of *Cordia* it must be considered a failure.

Attempts are being made to determine the exact causes of its disappearance in the field. Are these causes climatic or faunistic? Experiments have shown that the egg and the 1st stage larva are the vulnerable periods of the life cycle and that faunistic factors are probably the more important. Preliminary observations indicate that several species of ants play some role in the disappearance of the young larvae. Further investigations are being made.

(b) *Schematiza cordiae* Barb.

The first shipment of live insects was received from Trinidad on 7.7.47. Some difficulty was experienced in the shipment, many insects being dead on arrival. Breeding was commenced, as before, under strict quarantine until the specificity of *Schematiza* to its food material could be verified.

When the laboratory-reared population had reached a sufficient size, feeding tests on a total of 62 plants of economic importance were carried out (7) (Table I).

It became apparent from these tests that the specificity of *Schematiza* was not as high as that of *Thysanota*, for plants other than those of the Boraginaceae could be eaten by the larval stages of this insect (Table II). Of these, the only plant which was readily eaten by any stage was cabbage (*Brassica oleracea*). Further tests were accordingly carried out with this plant. It was found that although all larval stages would feed on Cabbage, the life cycle could not be completed on this plant. 1st and 2nd stage larvæ eventually died, but some of the 3rd stage were able to attain the adult stage, viz :—

| | | | | | |
|---|---|---|---|---|---|
| 1st stage : | Approximately | 2.8 o/o | attained | 2nd stage | before death |
| 2nd stage : | ,, | 44.0 o/o | ,, | 3rd ,, | ,, |
| 3rd stage : | ,, | 12.0 o/o | ,, | adult stage | |

Adult *Schematiza* would never feed on Cabbage.

Adults obtained from 3rd instar fed on cabbage showed no predilection to lay eggs on this plant when presented with Cabbage and *Cordia*.

The feeding tests were all carried out in Petri dishes of 10.5 cms. diameter containing leaves of the plant to be tested. Larvae were previously starved for 24 hours and adults for 48 hours. Temperature in insectarium — mean maximum 26.5°C., mean minimum 18.7°C. The true humidity could not be obtained, but it must have been very high, 90 o/o at least.

The feeding tests previously performed in Trinidad did not give these results, but it was found that experimental procedure was different, the insects not being confined to the leaves under conditions of high humidity. Consequently tests were repeated in both countries with a reversal of technique, and it was found that with the same technique results were

identical in both countries. In Mauritius, potted seedlings of cabbage and Chinese kale were placed in cages, a procedure similar to that which was used in Trinidad. No feeding occurred with any stage, the insects repeatedly wandering off the plants. They were replaced each day but all eventually died without feeding in a few days.

In view of these experiments the decision to release *Schematiza* was taken for the following reasons :—

I. The behaviour of *Schematiza* in Trinidad and Mauritius does not differ, as far as can be experimentally determined. Although cabbage can be eaten under certain conditions, this also occurs in Trinidad under similar circumstances, in spite of which it has never been found to feed on cabbage in the field.

II. The life cycle cannot be completed on any economic plant of value under any of the experimental conditions used.

III. Adult insects have no interest in cabbage for feeding or egg laying purposes under any circumstances.

IV. The abundance of *Cordia* and the suitability of Mauritian conditions for its growth and propagation make it unlikely that this weed will ever be *completely* eradicated, (for example, although *Opuntia tuna* Mill. is now of no importance due to the attacks of the Cochineal insects, it still survives in small numbers). It is improbable, therefore, that the adoption of a new host plant will become a biological necessity.

The first liberation was on 23.3.48, 1,000 adults being released. Liberations are still proceeding and to date (August 1948) a total of 13,200 adults have been released in 9 selected localities.

It would be premature to venture a statement as to the future of *Schematiza* in Mauritius, but it has already been found that in three localities where release was effected these insects have completed their life cycle. These localities are Reduit Gorge, Nicolière, and Constance. At the former, several generations have been completed and a focus of infestation has been established. Many bushes have been completely defoliated in this region.

The dry coastal regions do not seem favourable for *Schematiza*, but it is expected that it will become firmly established in the wetter parts of the Island. More than this cannot be said at present.

## Procedure of Liberation and the Selection of Localities

Whenever possible, it has been the policy to release a large number of adults in each selected locality. These adults are retained in the laboratory until copulation and egg laying is observed, the object being to ensure that eggs will be laid within a small focus after liberation. The released insects will eventually disperse and the chances of an individual finding a member of the other sex will diminish. The release of a large number of sexually mature adults in one locality, and the large number

of eggs laid will ensure that a future focus will be established. The latter is, of course, dependent upon the successful accomplishment of the life cycle. The resultant emergence of large numbers of adults within the focus will facilitate the prolification of the species by increasing the probability of the meeting of the sexes.

It must be emphasised that the liberation of these insects in large numbers in any one locality is not for the immediate purpose of destroying *Cordia* in that locality, but rather to establish the insect in its new environment. The localities are therefore selected, and this is the reason why it has been necessary to disappoint many who have requested that insects be released on the Cordia on their estates.

Results must not be expected soon after the release of these insects. Even if all of those released survive and reproduce, a considerable period must elapse before a population large enough to be of material effect can be built up.

## Flower and seed destroying insect

Shipments of a Chalcid seed parasite, *Eurytoma* n. sp., are at present being received from Trinidad. Its biology and a technique of handling this minute insect are being worked out. In addition, a trial shipment of a flower feeding microlepidopteran, *Chloropteryx* n. sp., (Geometridæ) has been received, and it is intended to commence breeding and testing this insect shortly. Both species have only been found on *Cordia* in Trinidad. Their future in the campaign against *Cordia* cannot yet be defined.

## Summary

1. The causes of the rapid spread and the present-day abundance of *Codia macrostachya* in Mauritius have been enumerated ; they are : the favourable climate, the dissemination of the seeds by several species of birds, and the lack of *Cordia's* natural enemies. The latter led to the decision to apply biological means of control, by importing its insect enemies from the West Indies, the natural home of this weed.

2. The methods of selecting a suitable species, and the precautions necessary before its release in Mauritius have been discussed.

Two leaf-eating insect species, *Physcnota alutacea* Boh. and *Schematiza cordiae* Barb. have been released in large numbers. Liberations of the latter are continuing. No recovery of the former has been made although its release was commenced in July, 1947. *Schematiza* has been found capable of breeding in the open and in one locality is present in large numbers, doing considerable damage to many *Cordia* plants in this area.

4. Investigations are now being made prior to the release of flower and seed destroying species. *Eurytoma* n. sp. is being received from Tri-

nidad, this is a true seed parasite, while a trial shipment of *Chloropteryx* sp. a flower feeder, has been received.

## Acknowledgements

The author is deeply indebted to Mr. A. L. MOUTIA for critically reading the manuscript and offering many valuable suggestions.

---

### TABLE 1

PLANTS USED IN FEEDING TESTS WITH *Physonota* AND *Schematiza*

| *Physonota only<br>SCIENTIFIC NAME | †Schematiza only<br>LOCAL NAME |
|---|---|
| **Boraginaceæ** | |
| *Cordia macrostachya* (Jacq.) Rœm. & Schult | Herbe Condé |
| *C. myxa* L. | Colle savon |
| *C. abyssinica* K. Sch. | Cordia Trianon |
| **C. aliodosa* Cham. | |
| *Erhetia acuminata* R. Br. | Boise chenille |
| **Tournefortia argentea* L. | Veloutier |
| **Trichodesma zeylanicum* R. Br. | Bourrache sauvage |
| **Heliotropium indicum* L. | Herbe papillon |
| **Convolvulaceæ** | |
| *Ipomea batatas* (L.) Lam. | Patate |
| **Solanaceæ** | |
| *Nicotiana tabacum* L. | Tabac |
| **Capsicum annuum* L. | Piment |
| *Lycopersicum esculentum* Mill. | Tomate |
| *Solanum tuberosum* L. | Pomme de Terre |
| *S. melongena* L. | Aubergine |
| *S. auriculatum* Ait. | Tabac marron |
| **Compositæ** | |
| *Lactuca sativa* L. | Laitue |
| *Dahlia variabilis* | Dahlia |
| *Eupatorium* sp. | Eupatorium |
| **Commelynaceæ** | |
| **Wikstroemia indica* Mey. | Herbe tourterelle |

TABLE I — *Continued*

PLANTS USED IN FEEDING TESTS WITH *Physonota* AND *Schematiza*

| **Physonota* only | †*Schematiza* only |
|---|---|
| SCIENTIFIC NAME | LOCAL NAME |
| **Bignoniaceæ** | |
| **Tabebuia pallida* Miers. | Tecoma |
| **Verbenaceæ** | |
| **Stachytarpheta jamaicensis* Vahl. | Herbe queue de rat |
| *Lantana camara* L. | Vieille fille |
| **Gramineæ** | |
| *Saccharum officinarum* L. | Canne à sucre |
| *Zea mays* L. | Maïs |
| *Stenotaphrum dimidiatum* Brongn. | Herbe bourrique |
| **Musaceæ** | |
| *Musa cavendishii* L. | Banane |
| **Sapindaceæ** | |
| *Euphorbia longana* Lam. | Longane |
| *Litchi chinensis* Sonn. | Litchis |
| **Cruciferæ** | |
| *Brassica oleracea* L. | Chou |
| *B. chinensis* L. | Petsai |
| †*B. alboglabra* Bailey | Chinese Kale |
| †*B. oleracea* L. var *botrytis* | Chou-fleur |
| **Liliaceæ** | |
| *Allium cepa* L. | Onion |
| **Furcroea gigantea* Vent. | Aloës |
| **Leguminasæ** | |
| *Phaseolus vulgaris L.* | Haricot |
| **Pisum sativum* L. | Petit pois |
| *Arachis hypogea* L. | Pistache |
| **Albizzia lebbek* Benth. | Bois noir |
| **Haematoxylon campechianum* L. | Campêche |
| *Tamarindus indica* L. | Tamarin |
| *Leucoena glauca* Benth. | Acacia |

TABLE I — *Continued*

PLANTS USED IN FEEDING TESTS WITH *Physonota* AND *Schematiza*

| *Physonota* only<br>SCIENTIFIC NAME | † *Schematiza* only<br>LOCAL NAME |
|---|---|
| ***Delonix regia*** Rafin | Flamboyant |
| ***Cæsalpina sepiara*** Roxb. | Safran |
| ****Cassia siamea*** Lam. | Cassia Florida |
| ***Cajanus cajan*** (L.) Mellsp. | Ambrevade |
| ****Canavalia ensiformis*** Dc. | Pois Sabre |
| ****Crotalaria*** sp. | Crotolaire |
| ****Pithecolobium dulce*** Benth. | Cassia Manille |
| †***Vigna catjang*** Walp. | Vohem |
| Lauraceæ | |
| ***Persea americana*** Mill. | Avocat |
| ***Cinnamomum camphora*** Nees. | Camphre |
| ***Litsea glutinosa*** C. B. Rob. | Bois d'Oiseau |
| Anonceæ | |
| ***Annona*** sp. | Atte, Cœur de bœuf. |
| Morinaceæ | |
| ***Artocarpus integrifolius*** L. | Jacq. |
| ***A. communis*** Forst. | Fruit à pain |
| Sosaceæ | |
| ***Prunus persica*** Stokes. | Pêche |
| ***Fragaria vesca*** L. | Fraise |
| ****Rubus roridus*** Lindl. | Framboise marronne |
| ***Rosa*** sp. | Rose |
| Cutaceæ | |
| ***Citrus aurantiifolia*** (Christon) Swingle | Limon |
| ***C. sinensis*** Osbeck. | Orange |
| Caricaceæ | |
| ***Carica papaya*** L. | Papaye |
| Myrtaceæ | |
| ***Psidium guajava*** L. | Goyave |
| ***P. cattleianum*** Sab. | Goyave de Chine |
| ***Eucalyptus*** spp. | Encalyptus |

TABLE I — *Continued*

PLANTS USED IN FEEDING TESTS WITH *Physonota* AND *Schematiza*

| **Physonota* only<br>SCIENTIFIC NAME | † *Schematiza* only<br>LOCAL NAME |
|---|---|
| *Eugenia cumini* (L) Merr. | Jamblon |
| *E. jambos* L. | Jambrosa |
| Bromeliaceæ | |
| **Ananas comosus* (L.) Merr. | Anana |
| Palmae. | |
| **Cocos nucifera* L. | Coco |
| Euphorbiaceæ | |
| *Manihot utilissima* Pohl. | Manioc |
| *Acalypha grandis* Benth. | Feuille Rouge |
| Umbelliferæ | |
| *Daucus carota* L. | Carotte |
| *Petroselium sativum* Hoffm. | Persil |
| Cucurbitaceæ | |
| *Cucurbita maxima* Duchesne. | Giraumon |
| *Sechium edule* Sw. | Chou-chou |
| Anacardiaceæ | |
| *Mangifera indica* L. | Mangue |
| Casuarinaceæ | |
| *Casuarina equisetifolia* L. | Filao |
| Combretaceæ | |
| **Terminalia catappa* L. | Badamier |
| *T. arjuna* W. and A. | Terminalia |
| Oleaceæ | |
| **Ligustrum walkeri* Decne. | Privet |
| Rhizophoraceæ | |
| **Rhizophora mucronata* Lam. | Manglier |

TABLE I — *Continued*

PLANTS USED IN FEEDING TESTS WITH *Physonota* AND *Schematiza*

**Physonota* only † *Schematiza* only

| SCIENTIFIC NAME | LOCAL NAME |
|---|---|
| Lythrraceæ | |
| **Lagerstroemia flos regina* Ritz. | Goyavier Fleur Royale |
| Theaceæ | |
| *Thea sinensis* L. | Thé |
| Dioscoreaceæ | |
| **Diascorea bulbifera* L. | Igname |
| Chenapodiaceæ | |
| *Beta vulgaris* L. | Betterave |
| Malvaceæ | |
| *Gossypium* sp. | Cotton |
| Rubiaceæ | |
| *Coffea* sp. | Café |
| **Vangueria madagascariensis* J. F. Gimal. | Vavangue |
| Orchidaceæ | |
| **Vanilla planifolia* Andr. | Vanille |
| Celastraceæ | |
| *Elaedendron orientale* Jacq. | Bois d'olive |
| Moraceæ | |
| **Ficus* sp. | Ficus (Lafouche) |
| Geraniaceæ | |
| *Pelargonium* sp. | Geranium |
| Coniferæ | |
| **Juniperus bedfordiana* Hort. | Juniper |

TABLE 4I

PLANTS WITH WHICH FEEDING OCCURRED (*Schematiza*)

1 — feeding as readily as on *Cordia macrostachya*
2 — small pieces excised
3 — punctures only
— no feeding

| Food plant | Local Name | Larval stage | | | Adult |
|---|---|---|---|---|---|
| | | 1st | 2nd | 3rd | |
| ***Cordia myxa*** L. | Collesavon | 2 | | 1 | — |
| *C. abyssinica* K. Sch. | Cordia Trianon | 2 | | 2 | 3 |
| ***Erhetia acuminata*** R. Br. | Bois chenille | 2 | | 2 | 1 |
| ***Brassica alboglagra*** Bailey. | Chinese Kale | 2 | | 2 | |
| ***B. oleracea*** L. var. ***botrytis.*** | Chou (cabbage) | 2 | 1 | 1 | — |
| *B. oleracea* L. | Chou-fleur | 3 | | 3 | |
| ***Lactuca sativa*** L. | Laitue | — | | 2 | — |
| ***Beta vulgaris*** L. | Betterave | 3 | | 2 | 3 |
| ***Phaseolus vulgaris*** L. | Haricot | 3 | | 2 | |
| ***Delonix regia*** Rafin. | Flamboyant | — | | 2 | — |
| ***Eugenia cumini*** (L.) Merr. | Jamblon | — | | 3 | |
| ***Terminalia arjuna*** W. & A. | Terminalia | — | | 3 | |
| ***Sechium edule*** Sw. | Chou Chou | — | | 3 | 3 |
| ***Diascorea bulbifera*** L. | Yam | 3 | | 2 | |

## BIBLIOGRAPHY

1. Donald, R.G. 1945 ... ... The insects of the Black Sage (*Cordia macrostachya*) in Trinidad. Dissertation for the Associateship of the Imperial College of Tropical Agriculture. Unpublished.

2. D'Emmerez de Charmoy, A. 1941... ... ... ... Le Bul Bul. Rev. Agri. Maur., **20**, pp. 154-8.

3. Kirby, I.E. & Adamson, A. M. 1944 ... ... ... Insects of Cordia in Trinidad. Unpublished.

4. Mamet, R. 1948. ... ... A Food-plant catalogue of the insects of Mauritius. Bull. no. 30, Sci. Ser., Dep. Agric. Mauritius, pp. 74.

5. McCallan, E. 1947. ... The effect of defoliation on the reproduction of *Cordia macrostachya*. In publication.

6. Moutia, L.A. 1947 ... ... En marge de la lutte contre l'Herbe Condé. Rev. Agri. Maur., **26**, No. 3, pp. 130-2, 5 Tables.

7. Moutia, L.A. 1948 ... ... Rep. Dep. Agric., Mauritius, 1947.

8. Simmonds, F.J. 1947 ... An illustration of effective control exerted by parasites on their host. Bull. Ent. Res. In publication.

9. Wiehe, P.O. 1946. ... The control of *Cordia macrostachya* (Jacq.). Roem. & Schult (Herbe Condé). Pub. No. 2?, Colony of Mauritius, pp. 11-43, 11 tables, 8 figures, 21 refs.

# MAURITIUS ECONOMIC COMMISSION 1947-48

## Findings, Recommendations and Comments

At the end of June, 1948, the Mauritius Economic Commission terminated its report. The report is divided into three main parts. Volume I contains a summary of the results of the Commission's investigations, its recommendations and replies to a set of questions concerning several aspects of the economy of the Island. Volume II consists of the reports, as reviewed by a Central Commitee of the Working Parties composed of Mauritius and overseas representatives. Volume III is a collection of statistical data used in the course of the several investigations.

Volume I, printed in Mauritius,* was made public in September. The other two volumes are being printed in England and are not yet available. Volume I consists of four sections the first of which (pp. 5-21) is a considered review of the matters studied by each Commitee or Working Party ; the second section (pp. 22-36) comprises a summary of each Committee's recommendations ; the third section (pp. 37-61) consists of the Commission's replies to the 44 questions which were handed over to the Chairman in London for guidance ; the fourth section (pp. 62-67) is made up of comments on the reports of some of the fourteen committees.

The Commission's Report forms as exhaustic a survey as possible of the whole economy of the Island — an economy based so largely on agriculture. It is desirable, therefore, that those parts of the report concerning more particularly the sugar industry and agriculture generally be given publicity in the *Revue Agricole*. Such reproduction, however, can only be given in instalments and it seems desirable, for the convenience of readers, to effect a certain regrouping so that, for instance, the review of a Committee's findings is followed immediately by the summary of recommendations and by the Commission's comments. This plan, therefore, has been adopted wherever possible and, in this issue, the pronouncement of Committees Nos 1 and 2 are reproduced.

# THE REPORT OF COMMITTEE No. 1

## Efficiency of Sugarcane Production in Mauritius

Yields of sugarcane in Mauritius have increased remarkably in recent years and the yield of sugar per cultivated acre compares favouraby with progressive sugar producing countries (except Hawaii and pre-war Java). The record sugar crop of 350,000 tons was obtained in 1947. There seems

* Government Press, August 1948, pp. 67.

to be no reason why this new record should not be surpassed as the island has yet to experience a year when all factors, among them climate, fertilizer supply, labour supply are normal and the newer varieties of cane exclusively under cultivation. There has been a marked deficiency of fertilizer supplies during the last five years particularly of nitrogen and potash. The cane varieties produced by the Sugarcane Research Station are now dominant in the island, the variety M 134/32 covering 80 per cent. of the total acreage and other Research Station varieties a further 16 per cent. Approximately 16,000 arpents are irrigated out of a total area of 145,000 arpents under sugarcane. A fair amount of boulder clearing has been done mechanically by estates possessing equipment and by others using the services of two contracting firms which provide mechanised service. Mechanical furrowing, subsoiling, etc., are done by many of the estates. The chief pests of sugarcane in the island are the white grub—*Clamora Smithi*, known locally as Phytalus and the borer *Diatraea Saccharifagus* each of which results in an annual loss of one million rupees. Cane is produced approximately one-half by estates with factories and one-half by large planters and by small planters and metayers. The small planters and metayers number about 16,000, cultivate a quarter of the cane acreage and produce 18 per cent. of the crop. An objective of a balanced industry should be to increase the yield of cane from small planter's lands to a figure approaching that obtained by the estates. For the industry as a whole, it is essential that all field assets should be brought to an even higher standard of efficiency so as to ensure the production of an annual target of 400,000 tons of sugar on the minimum area of good cane land and with due regard to the efficient use of man power. An adaptation to Mauritius conditions of the technical progress made in the other cane areas, e.g. Hawaii, could be a powerful factor in speeding efficiency and economy. The provision of more adequate amounts of suitable fertilizers at the appropriate times is an immediate need. Sugarcane research work, which has paid good dividends in the past, should be increased and intensified. It is a first class long-term investment and the results of research should be brought into practical use as soon as possible by extension work and the encouragement of demonstrations by the more efficient growers and by the institution of planters' competitions, annual agricultural shows and refresher courses for technical employees of the industry. Apart from the possession of fertile or potentially fertile soils, a main agricultural asset of the Colony is its labour force which has now inherited a tradition of good sugarcane cultivation. The technical calibre of labour is capable of improvement. But, in the first place, adequate and nutritious food supplies and health and welfare services are essential. A long term need is the expansion of mechanization. The sugar industry should set up a central organization for field mechanization from which could be drawn knowledge and experience to help large and small planters (the latter through co-operative credit and co-operative production societies) in the selection, organized operation and maintenance of mechanical equipment. With increassd me-

chanisation, a more skilled labour force will be required. The industries described in later chapters of the Report should afford opportunities for some years ahead for sugar workers who are displaced. It is the responsibility of the sugar industry to assist Government in measures taken to provide alternative employment. The Chairman and the majority of the Committee were in favour of the sugar industry taking over sugarcane research leaving the Department of Agriculture to carry out research work on intensive lines for other agricultural crops while still maintaining control over fundamental aspects of sugarcane culture — such as control of importation of sugarcane cuttings, quarantine arrangements, etc. Other members of the Committee considered that the present Department of Agriculture could be extended and strengthened to carry out research on sugarcane, secondary agricultural crops and animal husbandry.

The overseas commissioners, influenced by the recent losses of highly qualified technicians, owing to the inability of Government to provide adequate remuneration, favoured the taking over of sugarcane research by the industry, subject to adequate safeguards, e.g., wide choice in appointment of well-qualified scientific officers, terms of service, and extension of the benefits of research to small planters and metayers.

Technical training is provided at the Mauritius College of Agriculture, but the output of graduates is insufficient for the full demands of the industry to be met. The Sugarcane Research Station which has been "temporarily" housed in the College of Agriculture for the last 17 years should be found alternative accommodation in order that the number of students which can be taken in by the College may be increased.

Cost of production of sugarcane in Mauritius, apart from the years 1944 and 1945 which were characterized by violent cyclones, compares favourably with most other cane sugar producing countries. Cost of production per ton of cane, in general, decreases with the size of the holding, but it should be pointed out that interest and general overhead expenses are not included in the returns for large and small planters. In addition, the latter generally cultivates his fields himself with the help of his family so that the cost of labour is much below that of other classes of growers, and the data are thus not strictly comparable. For estates, there are considerable variations in the cost of production. The chief factors responsible for these variations are size of plantations, availability of labour, efficiency of labour, the differential incidence of cyclones and droughts, climatic and soil conditions and efficiency of management and technical supervision. Cost of production should, other things being equal, be reduced by continuous effort to plant new and better varieties and to mechanize, as far as possible, expensive field operations to the extent that this can be done, for example in loading, in other cane producing territories.

Irrigation facilities should be extended in dry areas to the limit that water resources permit. For the financing of field operations, there is

need for reorganization and development of credit facilities for small planters. At present about one-third of small planters are grouped in co-operative credit societies financed mainly by Government loans. Estates advance about one million rupees each year—an amount about equal to that advanced for cane cultivation by the co-operative credit societies.

## Summary of Recommendations

### COMMITTEE No. 1

### Efficiency of Sugarcane Production in Mauritius

1. Field efficiency should be raised to the highest standard amongst all classes of growers to produce up to 400,000 tons of sugar a year.

2. Steps should be taken immediately to bring the yields of small planters up to a level more comparable with estate yields. The Department of Agriculture should consider this as a first priority and increase the field demonstration and extension work already initiated.

3. Sugarcane producers should establish a central organization for field mechanization.

4. Co-operative production societies should be organized amongst small planters and mechanized equipment made available on a co-operative basis from three central machinery depots in concentrated areas of small planters.

5. Sugarcane research work should be increased and intensified, and the sugarcane research station should be provided with suitable accommodation and the senior research workers given salary scales sufficiently remunerative to attract the best men in the Island and outside.

6. Sugarcane producers would be well advised to press on with measures for establishing their own research organization for sugarcane, because the production of good cane varieties and the improvement of cultural methods are vital to the future success of the industry.

7. More accommodation for students is required at the College of Agriculture in order that the full demand for trained personnel be fulfilled.

8. A Trade School should be set up for thetraining of craftsmen in all industries of the Island especially having regard to the future development of mechanization in the sugarcane fields.

9. The nutrition of the field and factory force should be improved by local food production and the labourers' health and welfare kept under continuous review in conjunction with the Labour Unions. Co-operative effort among workers should be encouraged.

10. Small planters' competitions and annual agricultural shows should be organized.

11. Efforts should be made to organize technical conferences at intervals, to which technicians of Mauritius and other sugar producing territories would be invited.

12. The legislation governing importation of sugarcane cuttings should be tightened up to minimise the risk of importing pests or diseases.

13. There is need for expansion of agricultural credit facilities for small planters either through co-operative credit societies or through the Agricultural Bank which should be provided with powers to make short-term loans.

14. Centralization of administration of growing areas is the corollary of greater centralization of factories and would effect economies in field production.

---

## COMMENTS ON THE REPORT OF COMMITTEE No. 1

### Efficiency of Sugarcane Production in Mauritius

The report contains a balanced account of sugarcane production in Mauritius from which it appears that one most urgent necessity is an improvement in the cultivation methods of the small planters.

There are several reasons for small planters' yields being less than the estates' yields. The quality of the land on which small planters cultivate cane is considerably inferior to that cultivated by estates. Even if the intrinsic fertility of the land is considered, it can be shown that the planters occupy a considerably greater proportion of the poorer soil types and a lesser proportion of the best soil types than do the Estates In addition, the basic fertility of their soils has not been maintained. Although the small planter is entitled to a certain return of factory residues, it is often difficult for him to take advantage of this fact partly owing to transport difficulties and partly owing to financial stringency As a result, a proportion of them prefer to take payment for these residues in the form of the value of a few extra kilos of sugar per ton of cane. Many of the small planters keep a cow or two : part of the fodder for which is obtained in the form of cane tops from the estates—this would normally represent export of fertility from the estates but here again, in practice, much of the manure produced by the cow is sold back to the estates. On balance, there has thus been over several decades a transfer of fertility from the small planters' lands to the estates.

Education is sadly needed among many of the small planters on modern methods of cultivation—particularly with respect to fertilizers. Chemical nitrogenous fertilizers are almost universally used, but there has been considerable reluctance to purchase phosphatic guano and the use of potash is also restricted. Adequate fertilization almost invariably gives large responses on small planter s' lands.

One of the difficulties in improving the cane husbandry of small planters has been due to the fact that they were not organised and their large numbers (13,685 excluding 2,926 metayers) made it difficult for the agricultural instructors to contact more than a small proportion of them. The situation has improved somewhat with the development of the Co-operative Credit Societies through each of which a considerable number of small planters can be contacted, and the recent formation of an extension service attached to the Sugarcane Reasearch station is already producing good results. Hitherto, only three out of six field demonstrators have been appointed and it is urgently necessary that the full complement should be recruited at once. It should also be possible to group all small planters as *associés* of the co-operative credit societies in co-operative production units in order to facilitate extension work even if such *associés* do not avail themselves of the credit facilities offered by the Societies.

The development of the foliar diagnosis technique—which is now being extended to the small planters—should enable the fertility status of their sugarcane crop to be quickly determined and appropriate measures taken to correct deficiencies. Such results, used as a basis for demonstration plots, would convince the planters of the profits to be gained by proper husbandry. The rapid dissemination of new varieties has not caused any difficulty amongst small planters—news spreads rapidly amongst them—and the considerable improvements in yields which have taken place during the last few years have been chiefly due to the replacement of old varieties by improved types.

Profits made on cane cultivation are generally considerably lower than those made in the manufacturing process. At present, therefore, the economic limit to which tonnage per acre can be increased is considerably lower for planters than it is for estates with factory. The full degree of possible progress in cane husbandry amongst small and large planters cannot be achieved, unless these classes of growers have a full share in processing policy by representation proportional to the cane growing areas which they control.

The factories would thus gradually develop into a technical service for the cane growing industry and the benefit of its operation should be equitably shared between all growers.

---

## THE REPORT OF COMMITTEE No. 2

### Agricultural production (other than sugarcane), livestock and land settlement

The Committee was provided with a land utilisation map of Mauritius and this together with the local knowledge placed at the disposal of

the Committee demonstrated that a sufficient area of suitable land is available for an extension of secondary agricultural crops and of food production in the Colony. With mechanized clearing of land and efficient decortication machinery, the aloe fibre (*Furcraea gigantea*) industry could be developed to produce the necessary fibre for bagging the whole of the sugar produced in Mauritius. This would necessitate putting from 12,000 to 15,000 arpents of *Furcraea* on an organized plantation basis. The most urgent requirement for the development of fibre is a planning authority with executive powers to organize efficient production, set up jointly by the sugar and fibre industries. The obstacles to a rapid extension of tea production are under consumption in Mauritius, high prices and lack of an export outlet. The 2,000 arpents now under tea will be in full bearing by 1949-50 when tea production will amount to approximately 2,000,000 lbs. An investigation of the possibilities of export and the despatch of samples of specified grades for evaluation on the open market is the first desideratum. Should the product have a market at remunerative prices (which means reduced cost of production in Mauritius), the tea industry should make progress. The quality of local tobacco needs to be improved before any appreciable expansion is possible and research to this end should be intensified. There is scope for an extension in the production of certain main food crops although the island cannot hope in the near future to become greatly self-supporting in food over a series of years. The factors which prevent this are cyclones, lack of irrigation in drought areas, insufficient knowledge of efficient methods of production and lack of will to co-operate in production and marketing. Of the crops which can be grown successfully in Mauritius, maize, manioc, sweet potatoes, eddoes, yams, groundnuts, various legumes, vegetables and tropical fruits are the most important. Rice can be grown successfully in about three years out of five. A variety of spices and condiments also grow well, while the dependencies produce an important amount of coconut for copra from which oil is extracted in Mauritius.

Although Mauritius has not, since 1914, produced enough food for more than a tenth of its inhabitants for any prolonged period, it should be borne in mind that none of the food crops has been the subject of scientific research to an extent comparable with sugarcane. A permanent and secure food crop agriculture depends on adequate research and the use of modern methods including mechanical equipment. Government should support the development of food production by providing for a three-year period guaranteed minimum prices for the more important food products. Acreage bonuses in addition to guaranteed minimum prices are not recommended. The minimum prices guaranteed will, in the present years of high prices, not in most cases necessitate a call on subsidies. On the other hand, the minimum price guarantees should be limited to such quantities of each product as can under organized marketing schemes be disposed of at profitable prices.

There is an acute shortage of liquid milk in the island. The number of milch cows should be increased from the present 13,500 to 25,000 to

provide 300 cc. of milk per head per day. Improvements in the type of animal by grading up from imported breeds, in management, in improved feeding technique and in hygienic methods of milk distribution are urgently necessary. Encouragement should be given to increased rearing of goats, sheep, pigs, poultry and rabbits to supplement the meat supply which is inadequate.

The Committee supported the undertaking of three schemes of organized land settlement at a cost of Rs. 750,000 which, it is hoped, will demonstrate the potentialities for the production of crops other than sugarcane. Marketing arrangements for sugar, locally utilised fibre, and tobacco are, at present, reasonably adequate, but for crops with possibilities of greater home consumption or of export such as tea, fibre and preserves, grading and marking legislation should be introduced. Research on secondary crops should be considerably increased and facilities for training in practical agriculture are highly necessary. The formation of a Land Trust Board to record the use to which land is put and to ensure the utilization of uncultivated land should be proceeded with as soon as possible.

---

## Summary of Recommendations

### COMMITTEE No. 2

### Agricultural Production other than sugarcane

1. The cultivation of foodcrops should be increased.

2. The cultivation of such crops as maize, root crops, pulses and oil crops should be stimulated by the offer of a guaranteed minimum price over a short series of years and the importation of suitable light machinery for mechanized production.

3. Experimental work on a field scale should be carried out on temperate zone crops at higher altitude areas — such as wheat, oats, barley, linseed, etc., using modern methods of production.

4. The area under vegetables should be increased from 4,500 arpents to 6,500 arpents : there should also be extended fruit tree planting along river reserves and public highways in suitable localities.

5. The development of the Aloe Fibre industry on a plantation basis on unirrigated lands of low agricultural value should be proceeded with. Steps should be taken to procure efficient decorticating machinery and an area of 12,000 to 15,000 arpents selected for the plantation production of fibre to bag the Colony's sugar exports. For uses other than bags, the product needs careful grading.

6. The development of a larger home market for Mauritius tea should be investigated together with costs of production and distribution. As

regards exports, sample consignments should be sent to London for evaluation. A quality grading and marking scheme for tea should be promulgated under agricultural marketing legislation.

7. Research work on tobacco should be continued by the Department of Agriculture. It is important that the specialist officers of the Department, e.g., geneticist, physiologist, soil chemist and agronomist should work as a team on tobacco improvement work.

8. Shipping communications with the oil islands dependencies need improving with a view to transporting labour to fulfil the requirements of the coconut industry and to facilitate transport of copra as soon as processed for oil extraction in Mauritius.

9. The milk production of the Colony should be stepped up to provide 300 c.c. per head per day instead of the present 93 c.c. This should be done by grading up local cows, improved husbandry and increased provision of nutritious fodder so as to maintain a milch cow population of 25,000 instead of the present 13,500.

10. The rearing of pigs, goats, sheep and poultry should be given every encouragement. The short-term engagement of a poultry specialist from overseas is recommended. As regards poultry keeping, the Police Department should study methods of reducing the amount of larceny in the Colony.

11. It is recommended that the following Land Settlement schemes involving a total expenditure of Rs. 750,000 be proceeded with immediately—

(*a*) A co-operative small holding settlement consisting of a central farm of 50 acres and twenty small holdings of 5 acres each located on the best land ;

(*b*) A scheme of ten mixed holdings averaging 5 acres each for intensive production of food crops, including market garden produce, located on first grade land ;

(*c*) A scheme of 10 dairy holdings averaging 10 acres each with a proportion of mixed cultivation on land with climatic conditions suitable for grass development.

12. Co-operative production and marketing societies are necessary to enable the producer to market his products efficiently.

13. Grading and marking legislation is required for eggs, potatoes, maize, peanuts and other products in daily consumption.

14. A complete reorganization of research work by the Department of Agriculture on secondary crops and on animal husbandry is required.

15. Facilities should be offered for practical training in agriculture to peasant farmers. This should be linked with the central farm in the land settlement project.

16. The Agricultural College under a full-time principal should be developed to provide adequate training in all branches of agriculture and

to be responsible for the educational side of the extension services in various parts of the island.

17. More attention should be given to agricultural shows and cultivation competitions : an annual agricultural show should be organized.

18. Legislation designed to provide a solution to the excessive fragmentation of land as a result of the operation of the French law of succession should be proceeded with.

19. A Land Trust Board should be established for recording and directing the use of land and for ensuring that no utilisable land is left derelict.

## COMMENTS ON THE REPORT OF COMMITTEE No. 2

### Agricultural production (other than sugarcane), livestock and land settlement

The possibilities and limitations of agricultural production other than sugarcane have been outlined by the Working Party. For plantation crops, the chief requirement is initiative on the part of the leaders in agriculture and a will to see that such industries get a fair chance over at least a rotation period using the most modern methods. The production of food crops needs the attention of research specialists and the provision for trials, demonstration and propaganda of adequate equipment to produce these crops efficiently at the lowest cost.

The formation of a Land Trust Board should be given early consideration as the growing population of Mauritius needs full utilization of every available acre of land which can be cultivated. Every encouragement should be given to the schemes of organized land settlement on various classes of land, which have been approved by the Committee, so that the potentialities in Mauritius for the production of a range of foodcrops, other than sugarcane, can be determined once for all.

# MAURITIUS MOLASSES OF 1947

E. HADDON

Out of thirty-one factories, twenty-nine gave the purity of their final molasses, and only thirteen showed their filter-cake losses.

In order to check the composition of the final molasses all losses should be recorded.

It is only through the *true* purity of the molasses that the amount of sucrose to which *Millers and Planters* are entitled can be determined.

The following are the figures of the above thirteen mentioned factories :—

| | Sucrose in Filter-Cake | Sucrose in Clarified Juice | Purity of Clarified Juice | Published Purity of Molasses | Available Sucrose S.J.M. | Sucrose Extracted | Deduced figures | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Undetermined Losses | Sucrose in Molasses |
| 1 | 0.10 | 13.20 | 89.1 | 36.9 | 12.31 | 12.33 | 0.00 | 0.87 |
| 2 | 0.13 | 13.55 | 87.2 | 41.3 | 12.26 | 12.25 | 0.010 | 1.29 |
| 3 | 0.10 | 13.93 | 87.2 | 38.9 | 12.70 | 12.77 | 0.00 | 1.16 |
| 4 | 0.08 | 13.10 | 88.4 | 40.5 | 12.00 | 11.98 | 0.02 | 1.10 |
| 5 | 0.14 | 14.49 | 89.8 | 37.3 | 13.59 | 13 53 | 0.06 | 0.90 |
| 6 | 0.22 | 13.79 | 86.6 | 39.5 | 12.46 | 11.96 | 0.55 | 1.28 |
| 7 | 0.10 | 12.37 | 87.0 | 34.5 | 11.45 | 11.32 | 0.13 | 0.92 |
| 8 | 0.13 | 13.78 | 89.9 | 37.2 | 12.93 | 12.82 | 0.11 | 0.85 |
| 9 | 0.11 | 13.52 | 89.7 | 41.8 | 12.49 | 12.33 | 0.16 | 1.03 |
| 10 | 0.24 | 13.97 | 86.9 | 42.9 | 12.40 | 12.06 | 0.34 | 1.57 |
| 11 | 0 10 | 13.32 | 89.1 | 38.7 | 12.36 | 12.02 | 0.34 | 0.96 |
| 12 | 0.15 | 14.49 | 89.6 | 41.9 | 13.37 | 12.85 | 0.52 | 1.12 |
| 13 | 0.08 | 13.96 | 88.7 | 39.0 | 12.90 | 12.36 | 0.54 | 1.06 |

Purity of sugar equals polarization of sugar × 1.005

Available sucrose „ $\frac{\text{Purity of sugar (Purity clarified — Purity molasses)}}{\text{Purity of clarified (Purity of sugar — Purity of molasses)}}$

Undetermined losses „ Available sucrose — sucrose extracted

Sucrose in molasses „ Sucrose in clarified — (Sucrose extracted + undetermined losses).

As it is impossible for a factory not to *have undetermined losses*, some of the figures shown are consequently not correct and are due to the influence of certain optically active substances on the sucrose determination of molasses.

In the Revue Agricole of February 1944, it was shown that the sucrose found by the optical method is less than by the chemical method. *Neither* the Baryta method without addition of acetic acid, *nor* any modified clerget method, *nor* the best *invertase method*, can give the true sucrose, *simply because they do not remove amino-acid amides* such as Asparagine and Glutamine.

It cannot be ignored that apart from sucrose, which is extracted together with a small amount of *non-sugars*, the *remaining optically active substances of the clarified juice accumulate in the molasses*, which in weight represents about 36 times less than that of the clarified juice o/o cane.

Similar discrepancies are also noticed when overseas figures are examined.

---

## Results of the City and Guilds Examinations in Sugar Manufacture held on 27th April, 1948.

| NAME | GRADE | RESULT |
|---|---|---|
| Bernard Paul Jean Toulet | Final | Second Class |
| André d'Hotman de Villiers | Intermediate | Second Class |

# MAURITIUS HEMP PRODUCERS' SYNDICATE

## *Réunion générale annuelle, 1948.*

A la réunion générale annuelle du Syndicat des Filateurs, tenue le 16 avril dernier, M. J. René Maingard de Ville-ès-Offrans, président, présenta son rapport annuel agrémenté du rapport d'un comité spécial, dont M. Maingard était aussi le président, qui fut soumis à la Commission Economique.

Il ressort de l'exposé de M. Maingard que les filateurs ont livré à la sacherie du gouvernement, pendant l'année 1947, 940 tonnes de fibres brutes, dont une trentaine de tonnes provenaient de plantations de sisal et servirent exclusivement à la fabrication de gros fils pour cordage, le reste étant constitué de fibre de furcrœa. Au cours de la même période, 49.5 tonnes de sisal furent exportées.

Pendant l'année la sacherie a produit

735,241 sacs de la contenance de 80 kilos de sucre,
13,027 „ „ 55 „
66,416 yards de toile de filtre-presse,
4,777 yards de toile pour les sècheries des usines à thé,
12½ tonnes de fil fin embobiné pour la fabrication de ficelle et de cordage léger.

Les fibres furent vendues à la sacherie à Rs. 550 la tonne, ce qui, en présence du renchérissement de la main-d'œuvre et du coût général de la vie, est un prix jugé trop bas. En Europe et en Amérique les "*hard fibres*" sont cotés à environ Rs. 1,000 la tonne. Pour assurer aux filateurs un profit raisonnable il faudrait payer leurs fibres à Rs. 700 la tonne. Des négociations furent entamées avec la sacherie et il fut arrêté que les fibres seraient achetées aux prix suivants :

Rs. 675 la tonne lorsque les sacs de jute importés coûteraient Rs. 96 les cent (sacs de 55 kilos) et Rs. 700 quand les sacs de jute seraient à Rs. 100 les cent sacs.

Afin de restreindre l'expédition à la sacherie de fibres contenant trop de " son ", les filateurs pourraient fournir des fibres battues qui obtiendraient une majoration sur les prix ci-dessus de Rs. 50 la tonne pour les fibres de premier grade. Les fibres de deuxième grade seraient payés Rs. 50 de moins que celles de premier grade et la différence entre le pre-

mier et le troisième grade serait de Rs. 110 la tonne. Le Syndicat s'engagerait à ne pas fournir plus de cent tonnes de fibres de qualité inférieure pendant l'année 1948.

La production de sacs en 1947 a été inférieure à celle des années précédentes. Les causes de cette régression peuvent être attribuées d'une part à la suppression de l'énergie électrique par suite d'une sécheresse prolongée, d'autre part aux exigences des ouvriers de la sacherie peu disposés à fournir des heures supplémentaires de travail. Il faut aussi tenir en ligne de compte la fourniture irrégulière de la matière première. C'est pourquoi la sacherie n'a pu utiliser plus de 645 tonnes de fibres pendant l'année. Dans un but d'utilité publique le gouvernement intervint auprès des travailleurs et la sacherie travaille depuis à plein rendement. Elle produira à l'avenir des sacs de 80 kilos dont le prix de revient est inférieur à celui des sacs de 55 kilos et pourra absorber une production de 1,200 tonnes de fibre par an.

Les perspectives dans l'Inde, poursuivit M. Maingard, sont assez sombres. On ne peut guère envisager une baisse du prix des sacs de jute. Par ailleurs, si le chargement en vrac du sucre des Antilles à destination de l'Amérique a donné des résultats encourageants on ne peut guère songer à faire de même avec nos sucres à destination du Royaume-Uni. Il faut tenir compte de la polarisation, de l'humidité, des difficultés de l'entreposage, des altérations au cours d'une longue traversée. On peut dire sans trop se tromper qu'il faudra toujours ensacher nos sucres, c'est à dire que nous pourrions toujours écouler nos fibres sur le marché local.

M. Maingard donna ensuite lecture du rapport soumis à la Commission économique. Il fit allusion aux visites de MM. G. W. Lock, O.B.E. et P. W. Lees, les experts chargés par le Bureau des Colonies d'étudier sur place les moyens d'améliorer l'industrie de la fibre à l'île Maurice. Il souhaita la bienvenue à Sir Philippe Raffray, Kt., C.B.E., K.C. et lui offrit les remerciements de l'assemblée pour tout le dévouement qu'a mis Sir Philippe à faire mieux apprécier à Londres la situation exacte dans laquelle se trouve l'industrie de la fibre ici. Il fit mention de l'essai comparatif entrepris par la Division Agricole du Service de l'Agriculture à Chaumière. Il attira l'attention sur la floraison abondante et anormale des plants d'aloès cette année et souhaita que l'on arrive un jour à en déterminer exactement les causes. Enfin il parla de l'herbe Condé et des efforts que fait le Service de l'Agriculture dans le but de mettre un terme à son envahissement croissant.

M. Maingard termina son exposé en se félicitant des relations agréables existant entre les filateurs et le directeur intérimaire de l'Agriculture et en remerciant ses collègues de l'appui qu'ils lui ont donné pendant tout le temps qu'il a présidé aux affaires de leur syndicat.

# REPORT ON THE MAURITIUS FIBRE INDUSTRY

BY G. WINSLOW LOCK, O.B.E.
*Senior Agricultural Officer (Sisal), Department of Agriculture, Tanganyika Territory*

## I. FOREWORD

### Introduction

1. Arising out of a request by the Mauritius Government to the Secretary of State for the Colonies for a specialist officer to advise on the local fibre industry, I visited Mauritius from the 3rd October to the 7th November, 1947. The purpose of this visit was to report on the cultivation and selection of *furcræa*, or "aloe" as it is called, from which Mauritius hemp is obtained. Formerly this fibre was produced for export but nowadays it is almost exclusively used for making sugar-bags in Mauritius.

Mauritius is now producing over 330,000 tons of sugar a year and approximately 5,000 tons of fibre would be required to provide enough sacks for this tonnage. The present rate of hemp production, however, barely suffices to meet a sixth part of these requirements and in view of an acute shortage of jute, which may persist for a number of years, it would be a big advantage if Mauritius were self-supporting in sugar-bags. The main problem is whether the output of fibre could be increased so as to satisfy the needs of the sugar industry.

### History of the Hemp Industry

2. The Mauritius hemp industry was first established over 80 years ago but it has shown little stability in the production of fibre which has fluctuated according to economic and climatic vicissitudes. Statistics for the years 1882 to 1946 are given in Appendix I.* Up to the first world war, exports varied between one and two thousand tons annually. A record export figure of 3,100 tons was achieved in 1900 and there were similar peaks in 1906 and 1913. During the early twenties production declined to a few hundred tons each year.

When the Mauritius Hemp Producers Syndicate was formed in 1925 all fibre was exported through this body and production ascended again to over 2,000 tons per annum, continuing at this rate until the economic crisis

* Not reproduced here.

of 1930, thereafter dwindling to a point of insignificance in the world's market.

In 1932 the Sack Factory at Quatre Bornes was estabablished with Government assistance. After an uncertain start it has since provided an alternative outlet for Mauritius hemp thus contributing to a fall in exports. From 1942 up to the present time the entire production of hemp, amounting to 700-1,000 tons annually, has been absorbed by the Sack Factory for manufacture into sugar-bags or filter-press cloth. The Sack Factory proved invaluable during the second world war and its existence still constitutes a most useful adjunct to the Mauritius sugar industry.

The fibre is sold to the Sack Factory in a raw state and latterly the price paid for it has been fixed according to the cost of imported jute sacks. Thus it has come about that the selling price of Mauritius hemp is no longer related to the market for other hard fibres and instead it has to compete with jute, normally one of the cheapest fibres obtainable.

## A Brief Description of the Industry

3. The production of Mauritius hemp is principally confined to the dry regions on the western and leeward side of the island, generally known as the "fibre belt." The majority of the fibre mills are in the Black River district. During 1946 only 17 mills were working, some for short periods during the sugar off-season, and outputs varied from 20-100 tons per mill. The total quantity of fibre accepted by the Sack Factory amounted to 713 metric tons but from next year onwards it is hoped to consume up to 1,200 tons annually.

Many of the fibre mills are owned by small proprietors who have other interests besides fibre; these include growing sugarcane, planting *casuarina* or eucalyptus trees for timber poles, and minor crops, as well as preparing salt and charcoal. Their financial resources are usually limited.

The industry is mainly dependent upon exploiting wild growths of *furcræa* for leaf supplies; only a small acreage of *furcræa* having been planted. These wild growths, which vary in extent, occur in different parts of the island, but they are naturally most abundant in the fibre belt where the soils are immature and are covered with stones and boulders. Here *furcræa* may be found growing in association with a *Leucæna glauca* — *Pithecolobium dulce* thicket, interspersed with "Bois Noir" (*Albizzia lebbek*) and Tamarind (*Tamarindus indicus*) trees. Elsewhere *furcræa* exists in a low scrub community composed of "Herbe Condé (*Cordia interrupta*) and *Lantana camara*, both exotic plants. Under these conditions grasses are usually absent. *Furcræa* also grows to profusion in extensive patches under more or less open conditions on steep mountain sides and ravines.

## Problems of the Hemp Industry

4. The Mauritius hemp industry is unable to make any real progress because it has to contend with a series of adverse factors; these may be outlined as follows —

(i) Estates have to depend upon hand-fed raspadors as a suitable automatic decorticator has not yet been designed. This precludes large fibre outputs and so renders it difficult to reduce production costs. Present extraction methods are inefficient and account for half the cost of producing Mauritius hemp. Furthermore limited decorticating facilities do not warrant planting *furcræa* on a big scale.

(ii) The low fibre percentage of *furcræa*, besides contributing to high cutting and transport costs, also affects the rate of production.

(iii) The overgrown nature of the areas carrying wild *furcræa* is largely responsible for low yields both per acre and per ton of leaf; it also makes cutting difficult.

(iv) The comparatively slow growth of *furcræa*, which is accentuated by climatic and soil conditions results in poor yields per acre.

(v) The vast masses of stones and boulders on the land constitute a serious hindrance to the introduction of better agricultural practices which could improve yields.

(vi) The risk of damage from cyclones.

(vii) Competition from sugarcane cultivation which has monopolised all the best agricultural land.

(viii) The unduly large quantity of labour required to produce a ton of fibre coupled with relatively high wages.

(ix) The inability of the industry to export fibre at competitive prices in normal times due to exceptional production expenses.

(x) The vulnerable position of the industry as a whole owing to prices being contingent upon the jute market; it is thus dependent on the goodwill of the sugar industry when jute is plentiful.

As regards designing an improved decorticator this question is now being examined by a consulting engineer. Probably the best solution at this juncture would be a small and relatively inexpensive automatic machine capable of turning out from 200 to 300 tons of dry fibre per annum, and preferably one which could be manufactured in the island.

In respect of the low fibre percentages and poor yields of fibre, suggestions have been put forward in this report concerning the lines to be followed in the planting and management of *furcræa* with particular reference to shade, spacing and cutting. These give promise of better results than those obtained at present from cutting wild growths. It has to be recognized, however, that the introduction of plantation methods hinges

upon devising ways and means of dealing with the problem of moving stones and boulders. It is inevitable that the initial cost of such reclamation work will be considerable, even though performed by bulldozers, but it would not appear to be hopelessly disproportionate to the returns which might reasonably be expected from *furcræa* growing. The operation is tantamount to a capital improvement.

It must be admitted that Mauritius hemp cannot, in the nature of things, be produced cheaply. In normal times it is unfavourably placed for competing with other hard fibres and especially jute. An assured market affording a reasonable return on capital is therefore essential before the industry can engender confidence and estates can be rehabilitated.

## General Remarks on Future Development

5. Section II of this report comprises a detailed survey of the fibre producing districts of the island. This rough survey shows that the effective area under wild *furcræa* is only 7,500 acres. Taking into consideration that these areas can only be cut once every two years, and allowing for a paucity of large plants, together with premature withering of the lower leaves during the dry season, it is estimated that the potential fibre crop of Mauritius cannot exceed 1,000 to 1,200 tons per annum. Since there is a likelihood of yields declining it is apparent therefore, that production can only be maintained through adopting more intensive cultural methods.

The prospects of Mauritius becoming self-supporting in sugar-bags are slight. In order to produce the 5,000 tons of fibre required each year about 10,000 acres of bearing plantation *furcræa* would be needed, and after a period of years another 3,000 acres would have to be added to this figure to cover young areas planted to offset older fields going out of rotation. An expansion of this magnitude could not be attained without utilising the grey siliceous clays or the red earths which occur in the driest parts of the island. For reasons given later in this report these soils are of doubtful value for development. There is also a lack of machinery as well as a scarcity of skilled labour to cope with a total production of 5,000 tons.

It follows that any big increase in fibre production would have to be accompanied by an appropriate extension of the Sack Factory.

Careful consideration of a proposal that sisal should supplant *furcræa* has led to the conclusion that this step would be inadvisable. In the first place sisal does not thrive particularly well in the drier zones of the fibre belt and secondly male labour is necessary for the unpopular and hard work of harvesting its leaves, whereas cutting *furcraea* is comparatively light work and may be undertaken by women. Moreover, sisal fibre is not an ideal raw material for weaving into sack-cloth neither is it best suited for the type of machinery installed at the Sack Factory. On the other hand sugar-bags made from Mauritius hemp have an excellent reputation.

It is impossible to foretell how long gunny-bags will be in short supply, but the present time certainly appears to be propitious for putting the Mauritius hemp industry on a sounder footing. The future of the industry can be viewed from its immediate, short term and long-term aspects.

(*a*) *The immediate aspect* : Producers should be encouraged to supply enough fibre from wild growths to keep the Sack Factory working at full capacity.

(*b*) *The short-term aspect* : The industry would benefit by concentrating production as far as possible to fewer factories. Assuming that there is no change in existing fibre extraction methods, each factory should aim at producing approximately 100 tons of fibre annually while their combined outputs should meet the requirements of the Sack Factory. In order to strengthen the future supply of raw material there should be a gradual transition from the old extensive system to more intensive plantation methods. A conservative estimate of probable fibre yields indicates that each estate should eventually have about 200 acres of *furcraea* under cultivation, most of which could be sited on selected land. Thus an annual crop of 1,200 tons could be expected from 2,100 acres of cultivated *furcraea*.

(*c*) *The long-term aspect :* The long-term aspect envisages greatly increased production and consumption of Mauritius hemp. This cannot be achieved unless the industry is equipped with a decorticator capable of dealing with large quantities of leaf. Naturally the area of planted *furcraea* would have to be increased accordingly but the formidable task of clearing the stones and boulders from large tracts of land may well prove to be a limiting factor to expansion on a big scale. An outside figure would be some 7,000 acres of *furcraea* yielding a total fibre crop of 3,500 to 4,000 tons annually. The fact should not be overlooked, however, that research into better ways of cultivating *furcraea* could conceivably result in higher fibre yields per acre than those estimated and this might compensate for any limitations imposed by the stone and boulder problem.

The report now goes on to deal with the industry in greater detail.

## II. DETAILED SURVEY OF FIBRE PRODUCING DISTRICTS

In this section various parts of this island where hemp is produced are described in detail, and some notes are given on their potentialities for future development.

### Black River District

6. *Geographical Description.* The Black River district extends from

Grand River North West, two miles from Port Louis, southwards along the eastern seaboard down to Baie du Cap on the south-western coast. The eastern boundary coincides with the Midland Railway which runs in a south-westerly direction as far as Petite Rivière. From this point the border line continues nearly due south striking across to the peaks of the Grand Malabar, Corps de Garde and Trois Mamelles mountain ranges and thence forward along the 1,700 ft. contour near the top of the escarpment of the Plaines Wilhems plateau and the Savane massif. The latter section is tortuous and embraces the Black River gorges and the Chamarel basin. Finally it joins up with the Baie du Cap river which flows to the south.

The district is about 22 miles long, and its breadth varies from 3 to 5½ miles, being widest in the central section. For the most part it comprises a gently undulating coastal plain between the escarpments and the sea, broken only by the isolated Tourelle du Tamarin and Le Morne mountains. About midway the district is intersected by three main rivers flowing to the west, viz., Rivière du Rempart, Tamarind River, and the Black River, all of which debouch into the sea close to the Tourelle du Tamarin mountain.

For the purpose of this report the Black River district may be divided into two areas separated by the Tamarind River, described as Black River North and Black River South. The bulk of Mauritius hemp production comes from the Black River North area.

## Black River North

7. *Petite Rivière Area.* At the northernmost tip of this locality, near the Martello tower on the coast, are some 200 acres of open dry grass country. The soil is thin brownish-yellow clay, admixed with small stones and rock. *Furcræa* plants are scant and those present were suffering from drought. The land is useless for *furcræa* cultivation.

Within a mile, the coastal road to Pointe aux Sables enters a region of dense *Pithecolobium* thickets containing extremely sparse stands of *furcræa*, mostly droughty and of no economic value. In addition there are occasional clumps of *A. americana*. Fringing the coastline coconuts and small tobacco plots occur on patches of coral sand and red soil. Inland beyond a narrow strip of bush a considerable area of sugarcane extends up to the main road from Port Louis to Black River.

Near a small creek known as Mare Samson, a lowbacked ridge rises steadily towards a rocky scarp in the west on which is sited Petit Verger fibre factory. This ridge carried a ten-foot high ticket of *furcræa*, *Leucæna glauca* and *Pithecolobium dulce*, estimated to be about 400 acres in extent. Rough ox-cart paths had been cut and the area was being worked for fibre and charcoal.

The *furcræa* consisted of a congested stand of small plants, all displaying drought symptoms, but higher up, possibly on deeper soil, the plants were larger and taller. A headman stated that these were the

remnants of a plantation twenty-one years old. Many appeared to have grown slowly since they were only half-way through their life-cycle despite gross undercutting in the past. The dry conditions had induced premature withering of the lowest leaves and only the uppermost leaves could be harvested.

The soil is primarily a red earth having a 60-80 per cent. cover of boulders of one to two feet in diameter. There are many rocky outcrops particularly towards the higher levels. Apart from the boulder difficulty, the soil lends itself to *furcraea* cultivation although the climate is undoubtedly dry (30-35 inches rainfall). Under present conditions annual fibre yields must be low.

Beyond the Petit Verger tongue of *furcraea* were irrigated sugarcane fields served by the Black River Railway line. Here, and within two or three miles radius around Petite Rivière village, there is little scope for *furcraea* growing.

Sugarcane fields also extended for the most part on both sides of the road to Belle Vue and the Lighthouse. A small fibre mill obtains its leaf from a 200 acres ticket situated to the south which stretched as far as Albion station. Another mile long belt, estimated at 250 acres, occurred along the cliff near Mount Jacot.

From the Belle Vue turning to Albion (a derelict sugar factory) the road runs alongside the Black River railway. On the seaward side there was bush carrying a thin and irregular stand of *furcraea* ; this probably formed part of the Belle Vue block. On the landyard side existed a fairly large old plantation of eucalyptus interplanted with a thick secondary growth of uneven yellowish *furcraea*, mixed with *herbe condé, pithecolobium* and occasional mango trees. The area had not been cut for some years. The soil is a dark brown to greyish-black clay with changes to a red earth further up a slight slope. Here the *furcraea* was a better colour, had longer leaf, and fewer of its lowest leaf whorls had withered. The entire area, amounting to some 200 acres, contained many massive boulders besides smaller stones and rock outcrops. Despite altered soil conditions and the low rainfall, the general character of the *furcraea* in this locality suggested that it might be grown on plantation lines with a reasonable chance of success. The boulders, however, constitute a serious impediment to working the land.

A patch of sisal found growing in the bush and along the railway track near Albion had long and green leaf but the plants were dormant.

8. *Plaine St. Pierre Area.* This region lies to the south of Petite Rivière and extends about 3 miles inland. Between Battery and La Mecque, near the coast, sugarcane cultivation has displaced wild *furcraea* except for a two mile strip along the cliffs. This is of doubtful value for fibre exploitation. To the east can be seen the edge of the main Plaine St. Pierre block of *furcraea* thicket which runs up to the Grand Malabar and Corps de Garde group of mountains.

A small area of young sisal, interplanted with eucalyptus saplings,

had been planted at La Mecque. The sisal varied from 2½ to 4 feet in height and was spaced in four rows, each 3½ feet apart, between two long piles of stones. Growth had been unsatisfactory mainly owing to the dry conditions. The leaves were greyish-green and the lowest ones had yellowed and collapsed. *Leucœna glauca* stumps were growing amidst the plants and the stacked stones. Another small block of young sisal nearer Médine, also planted with eucalyptus, was a better colour although the leaf was flaccid. More young sisal on a poor brashy yellow soil south of Médine was distinctly unthrifty.

9. *Palmyre Area.* A belt of 600 acres of tall dense *Leucœna glauca* thicket occurs about 1½ miles south of the cane fields around Médine. It is intersected by a branch road to Flic-en-Flacq. The soil is dark grey and becomes dusty in dry weather on account of its fine texture. Beneath the almost impenetrable bush it carried a pure stand of *furcraea* which is notable for a high proportion of exceptionally tall plants bearing leaves five to six feet long. Measuremets indicated that some of these plants had produced about 300 leaves each and yet they still showed no sings of poling. Three fibre factories draw leaf from this block.

10. *La Ferme Reservoir Area.* The largest single block of *furcraea* in Mauritius lies to the north, west and south of the La Ferme Reservoir in the region between Grand Malabar mountain and Mt. du Rempart. The reservoir itself is enclosed on two sides by the Corps de Garde and Mt. St. Pierre mountainous chain. The total area of *furcraea* is about 4,600 acres. There are six fibre mills and during 1946 they produced 304 tons or nearly 43 per cent. of the total production of the island.

Except for the precipitous mountain slopes, the terrain falls away gently towards the sea, flattening out near the main road to Black River, Soils vary considerably from a fertile red earth to a more highly laterised yellowish-brown type. Rocks and boulders abound over the whole area. Dense stands of wild *furcraea,* mostly under *Leucaena glauca* were to be found everywhere, sometimes running up to inaccessible heights on the mountain sides. There were several small and isolated plantings of both *furcraea* and sisal, the majority being under *casuarina* shade. " Herbe Condé " was the principal weed.

At the higher elevations (5-600 feet) the annual rainfall is about 45-50 inches but it diminishes within a short distance to 30-35 inches nearer the coast. Most of the planted *furcraea* was in the wetter part while the bulk of the sisal was in the drier zone. Sugarcane cultivation is steadily making inroads upon the *furcraea,* especially at the upper levels.

The condition of the *furcraea* improved markedly as the rainfall increased, in spite of bush and weeds, and usually more leaves could be cut per plant. Plantation *furcraea* had turgid, broad, bright yellow-green leaves particularly in places exposed to sunlight. 5 × 5 feet (1.742 plants per acre) was a common spacing ; boulders had been piled between the rows and a profuse growth of " herbe condé " had been slashed at knee-height. An average three-years old plant, 4½ feet high, was bearing a

total of 44 sound leaves. Other small fields of recently planted *furcraea* tended to be very irregular and rather neglected.

Some sisal, aged one year, spaced 5 × 3 feet (2,900 plants per acre), and planted on elevated stony land which had previously been under sugarcane, was backward. Approximately 100 acres of sisal lower down, probably planted 10-12 years ago, demonstrated the difficulties of dealing with the stones. Both single and double-row spacings had been tried. In one case the plants were spaced 10 × 1½ × 5 feet (1,515 per acre) with the boulders attached to one side of the ane between the twin rows. The sisal had been cut regularly and was approaching the poling stage having produced 180-200 leaves. Although its growth had not been rapid, the sisal was well developed and its leaves were long and clean, but wherever the soil was thin the plants exhibited mild drought symptoms. They needed desuckering and were not very firmly rooted. The area was under fairly dense *casuarina* shade.

While it was evident that lack of moisture was the chief factor limiting the growth of both *furcraea* and sisal, on the whole the former appeared to have withstood the dry season better than sisal. The sisal might also have been retarded by temperature effects.

The La Ferme reservoir area has certain advantages for developing large scale *furcraea* plantations. It would clearly be a first choice for siting any central decorticating factories should the Mauritius hemp industry be reorganised on such lines. For example a factory might be sited in the vicinity of Bambous where the gradients are favourable for leaf transport and there is a good water-supply.

11. *Clarence-Wolmar Area.* Skirting the Mon Vallon Spur, a broad stretch of canefields extended from the Palma road in a south-westerly direction towards Clarence and Wolmar close to the coast. There were no considerable blocks of *furcraea* thicket like those further north. A patch of hillside *furcraea* on Mon Vallon, together with other sparse stands by the Tamarind road, were hardly worth exploitation.

Nearby was a small three years old plantation of *furcraea*; part was under exceptionally heavy *casuarina* shade and part under open conditions. The plants in the shade had been planted in staggered double rows spaced 6 × 5 × 6 feet (1,320 plants per acre). The trees, about 20 feet high, were spaced 11 × 8 feet apart. The shaded *furcraea* had dark green shiny leaves, four to five feet long. These leaves were light, narrow, flaccid, and many of them dropped, but there were comparatively few marginal thorns. Each plant had about 38 leaves which contained fine fibre. A general impression gained was that heavy non-deciduous shade is undesirable for *furcraea*.

The plants in the open, spaced 5 × 3 × 4 feet (2,722 plants per acre) provided a striking contrast. The leaves were a vivid yellowish green, 4½ feet long, broad, and had marked marginal thorns which had abraded other interlocking leaves. The average number of leaves per plant was about

forty. Four outside plants had poled at bole heights of 10-18 inches and these had possibly produced only 80-110 leaves each since planting.

12. *Tamarind Valley.* Topographically this valley of 4,600 acres looked suitable for development into a fibre plantation. Near the road a rich red loam had already been cleared of many sizeable boulders by bulldozing in preparation for sugarcane. Unfortunately higher up this broad valley the soil gradually changes into a tenacious chocolate to greyish-black siliceous clay, prone to waterlogging during wet weather and fissuring, though not excessively so, upon drying. Rocks and boulders are common, particularly along the foothills. The dominant vegetation was *Pithecolobium* bush broken by grassy glades. *Furcraea* was virtually non-existent in the shallow valley bottom, the majority of the wild growths arising on the perimeter, often spreading high up on the mountain sides where the soil possesses better physical properties. In places there was an abrupt demarcation of the *furcraea* indicating different soil conditions. A large proportion of the plants were of the *malgache* variety and those on clayey soil were stunted.

Fibre production from the Tamarind valley barely amounts to 50 tons per annum. Only the foothills appeared suitable for *furcraea* and any future developments should be confined to these areas which total several hundred acres. Whether *furcraea* could be grown on the plastic grey clays in the valley basin is highly problematical. These soils, originally formed under water-logged conditions, have a fine texture, contain no quartz particles, and are reported to have a lower horizon of calcium sulphate at a depth of three feet. It is therefore difficult to say if their physical state could be improved through mechanical cultivation, but a few exploratory trials, including ridging, might be justified. The soil structure could be permanently damaged through ill-timed cultivation or when the soil was too wet. Conservation of soil moisture is all-important because the district has a long and pronounced dry season.

13. *Tamarind Mountain Area.* The Tourelle du Tamarin mountain, rising to 1,800 ft., above sea-level makes a conspicuous landmark in the Black River district. The open savannah country at its base is unsuitable for *furcraea* because conditions are too dry and the soil is an unproductive black clay strewn with boulders.

Abutting from this peak to the east is Tamarind mountain which forms part of the River du Bouga valley. This valley resembles the Tamarind valley in many respects. It comprises 2,500 acres of bush on slightly sloping land and at first sight offered possibilities for conversion into a fairly large fibre estate. Vegetation comprised a *Pithecolobium — Acacia* thorn thicket having an abundant undergrowth of *herbe condé*. There are not many stones except higher up the hillslopes, but once again the predominant soil type is a sticky, fine textured, siliceous greyish-black clay derived from basalt rocks. Wherever there is acacia scrub the soil is cleary unfavourable for any crop. Most of the rainfall (35 inches) is distributed over the period December to April.

Wild *furcraea* occupied many of the rocky mountain slopes where it grew long leaf. Elsewhere, at lower elevations, it had been spread by the primitive expedient of broadcasting bulbils thickly under the bush. Those which had fallen on open ground had grown better and showed less wilting than others under tree shade. After a considerable number of years the results obtained by this method are similar to an uncontrolled wild *furcraea* area.

In the case of plantation of *furcraea* started in this area seventeen years ago using a spacing of 4 × 2½ feet (4,356 plants per acre), the plants had boles about thirty inches high. They were growing under a deciduous Pithecolobium thicket and eight cuttings had been taken on cycles lasting from 18 to 24 months. Hard cutting was unavoidable due to the proximity of the plants and the heavy bush. An average of sixteen leaves per plant had been removed on the occasion of the last cutting and this reflected slow growth. It was anticipated that the *furcraea* would last for another five years before poling. On the whole the dimensions of the leaf corresponded roughly to those of sisal since the leaf was light and narrow. The high density of plants in conjunction with competitive bush, low rainfall and a desiccated clayey soil, constituted the principal factors leading to slow growth; in fact all the signs pointed to intermittent unfurling of new leaves correlated with rainy periods. It was remarkable that the *furcraea* had survived such discouraging conditions so well.

Two clumps of wild *furcraea*, growing on a deep clay soil near the main stream bed, were noteworthy. That in the shade of Pithecolobium and Tamarind trees was suffering badly from water shortage, while the other clump in sunlight was in good fettle and all the plants had tall stems. Regular cutting had been practised because these areas were accessible.

Upon further consideration this valley should not be summarily ruled out for *furcraea* growing. The conditions are unquestionably difficult but the survival of the *furcraea* does not seem to be totally without significance. Faster growth could be induced given means to ameliorate the moisture holding capacity of the soil and to control bush and "herbe condé." The comparative absence of stones is a big advantage. Less chance of failure might be obtained on the more friable brownish-grey soils which occur on the upper parts of slight slopes. It needs to be emphasised, however, that any extension of *furcraea* planting should be undertaken with great caution.

14. *Case Noyale Area.* The terrain along the lower reaches of the Black River valley is too hilly for *furcraea* plantations. On the promontory between the bays of Grande Rivière Noire and Petite Rivière Noire, may be found some 300 acres of wild aloes growing on high rocky ground. The *malgache* variety was more common in this part of the district. A short distance further south between Petite and Grand Case Noyale settlements, another 100 acres of dense *furcraea* existed. Both of the localities are rocky and dry and offer little scope for development. This is equally true

for most of the narrow coastal plain which runs down to Le Morne and onwards to Baie du Cap. In this corner of the island the annual rainfall is about 50 inches and much of the land was given over to maize growing.

The Chamarel basin, lying at the top of the escarpment above Case Noyale, is too broken for *furcraea* planting and its highly coloured soils are prone to erode under the prevailing rainfall of 75 inches. Both varieties of *fucraea* occur amongst the rank vegetation.

## Plain Wilhems District

15. This district adjoins the Black River district on the east and it is densely populated. Petit Malabar hill carried a thin stand of *furcraea* and more was growing in ravines (the *malgache* species was dominant in the upper reaches), but all of these growths are unimportant.

## Moka District

16. The Moka district lies roughly in the centre of the island. It does not contain any extensive areas of *furcraea* apart from a 150 acre belt on the steep sides of Mount Ory (near Port Louis) which is rarely exploited. Arid conditions combined with poor soils make the Anse Courtois valley unsuitable for *furcraea*.

The Midlands tract of waste land is also valueless for *furcraea* growing; the rainfall averaging 150 inches per annum while the soils are highly laterized. The general elevation is about 1,400 feet and the climate is therefore too cold as well as too wet for *furcraea*. Low temperatures resulted in stunted broadleafed plants.

## Port Louis District

17. The only point of interest in this locality arises from the fact that many years ago an unsuccessful attempt was made to grow sisal on the siliceous grey clays forming the Plaine Lauzun. The few remaining sisal plants were stunted, exhibiting severe drought symptoms.

## Pamplemousses District

18. The Pamplemousses District lies to the north of Port Louis and it comprises the north-western section of the island as far as Grand Baie. The rainfall is apt to be deficient especially within a mile or two of the coast which lies well outside the 50 inches isohyet.

Sugarcane fields extended over most of the district where irrigation was generally necessary. In the north either sugarcane or casuarina plantations had largely taken the place of *furcraea* except for small isolated patches on the coastal edge far removed from irrigation water. Although a solitary fibre factory was operating at Mon Choisy and a small attempt

had recently been made to plant *furcraea* there, nowadays there is virtually no room left for fibre production in the north of the district. The immature soils are yellow-brown and exceedingly stony, while much of the *furcraea* was wilted.

South of Baie de l'Arsenal there is an area of one thousand acres which is marked " scrub jungle " on the map. The greater part was already under sugarcane save for desolate blocks of unsuitable soil covered with a low scrub of lantana and *furcraea*, the latter being dwarfed and sparse.

Less development had taken place in the Richeterre locality near Port Louis where there was hardly any sugarcane but an increasing area had been been planted with tobacco and other small-holder's crops. The soil is a deep red loam possessing a fine crumb structure over which are distributed many large boulders and relatively few small stones. It appeared suitable for both *furcraea* and sisal. The rainfall, however, is low and for four years during the last decade it was less than 30 inches and in some seasons only 20 inches Wild *furcraea* was not extensive but areas examined were chiefly composed of big plants growing in *Leucaena glauca* and five feet high " herbe condé. " *Cynodon dactylon* was a troublesome weed on cleared land. *A americana* was common on roadsides and elsewhere there were cashew nuts, mangoes and coconuts. A poor and badly distributed rainfall constitutes the principal obstacle to growing *furcraea* in this district. This cannot easily be overcome by means of mechanical cultivation due to the many large boulders ; water supplies for factories are also lacking.

## Rivière du Rempart District

19. Very little *furcraea* has been left in the Mapou locality. Conditions closely resemble those around Trou aux Biches in the neighbouring Pamplemousses district.

## Flacq District

20. The Plaine des Roches is a lava bed composed of rocks which are highly resistant to weathering. It is literally a plain of rugged angular rocks and slabs full of hollows and gulleys, and the rough going absolutely debars crop cultivation. Here and there vegetation, which grows in tiny pockets of fertile reddish-brown to grey soil, contained a little open *furcraea* and much " herbe condé. " The rainfall is about 50 inches and it may be assumed that if there was any land of agricultural value it would have been planted with sugarcane. Long ago some sisal had been planted in the northern section ; the plants were fairly good but very congested and overgrown. Incidentally " banding disease " of sisal was observed for the first time in some sucker plants growing on an artifical embankment of stones.

To the south there were thick cluster of bush-free *furcraea* growing on thin and rocky ground near the sea-shore by Poste de Flacq. Both the size of the plants and the incidence of poling were irregular. The diffused

nature of the countryside made it difficult to survey but it does not appear to have great possibilities for hemp production despite a favourable rainfall. Some 60 acres of overcrowded old sisal was growing well in competition with bush and contained poling plants which had produced about 250 leaves each.

Between Argy and Rivière Sèche, seven miles further south, the rocky land with its thin yellowish-brown soils carried a " herbe condé "—lantana scrub containing very few aloes.

## Summary

21. Former assessments of the area of wild *furcraea* in Mauritius have varied between 16-20,000 acres. These figures no longer give a true picture as some adjustment is now necessary on account of a recent and growing expansion of sugarcane cultivation. Moreover they are misleading for the purpose of crop estimation because they not only include inaccessible growths on mountain sides and considerable tracts of virtually useless country such as the Plaine des Roches, but in addition small disconnected areas which are of little economic importance.

During my travels in Mauritius I made an attempt to map the major areas of *furcraea*, particularly those occurring in the Black River district. This rough survey cannot be claimed to be accurate but it does serve to show the extent of *furcraea* which can be exploited at the present time. In two instances the actual acreage was reduced to compensate for patches void of *furcraea* or where the stand of plants was exceptionally thin. The results are summarised in the following table.

| *Locality* | *Acreage* | |
|---|---|---|
| BLACK RIVER — NORTH : | | |
| Petite Rivière ... ... ... | 400 | |
| Belle Vue ... ... ... | 200 | |
| Mount Jacot ... ... ... | 250 | |
| Albion ... ... ... | 200 | |
| Palmyre ... ... ... | 600 | |
| La Ferme Reservoir ... ... | 4,600 | |
| Tamarind Valley ... ... | 350 | |
| | | 6,600 |
| BLACK RIVER — SOUTH : | | |
| Tamarind mountain ... ... | 350 | |
| Case Noyale ... ... ... | 400 | |
| | | 750 |
| MOKA DISTRICT : | | |
| Mount Ory ... ... ... | | 150 |
| TOTAL ACREAGE ... | | 7,500 |

The total acreage is consistent with an annual production of 1,000 tons of Mauritius hemp. It is apparent that there are insufficient reserves of leaf for a yearly output of 5,000 tons and that increased production could only be attained by adopting more intensive methods.

## III. THE PLANT

22. Mauritius hemp is derived from the leaves of *Furcraea gigantea*, Vent, variously styled as *furcraea, fourcroya* and, incorrectly " aloe. " Its introduction into Mauritius from Brazil about 1,750 is attributed to a French missionary. It soon became naturalised and spread over a wide part of the Island.

23. Like sisal (*Agave sisalana* Perrine), *furcraea* is a member of the family *Amaryllidaceae*. Both are *monocotyledonous*. *Furcraea* is a succulent plant having long *oblanceolate* undulate leaves growing in whorls around a short stem or trunk. Its *phyllotaxis* or leaf-arrangement is the same as that of sisal. The leaves are unfurled in a rhythmic sequence on a spiral pattern so that the 13th leaf is almost directly above the first, thus giving an angle of divergence of approximately 137½° between successive leaves. On a newly cut plant it is fairly easy to distinguish the spiral of every fifth leaf from that of every eighth leaf which runs counterwise, and the spirals may be either clockwise or anti-clockwise. The leaves are attached to the stem by a broad base or butt. On a full-grown plant they may vary from 140-240 cms. in length and 15-20 cms. in width at the broadest part, usually about half-way down the leaf. Each leaf is constricted just above its base ; at this point the cross-section is roughly triangular, progressively becoming wider and flattening out towards the middle of the leaf before it tapers towards the tip. The leaf often buckles in this region during a drought. On older plants the butt-end of a cut leaf is very similar in size to that of sisal, especially if close cutting has not been practised. Single leaves may vary in weight from 400-1,500 grams., depending as a rule upon the length of the leaf, but a leaf from a young plant may weigh over twice as much as a leaf of the same length from an old plant which has been cut regularly.

24. *Furcraea* leaves are usually very fleshy in the butt-end region and on young plants they often snap across cleanly at this point. The blade not invariably has narrow shallow longitudinal grooves and it is apt to be brittle. The acute leaf-tip of *Furcraea gigantea* is invariably armed with a fine tip-thorn, *piquant*, about 1-5 mm. long which is always present on newly unfurled leaves but may have disappeared on the older leaves. This is a sure distinguishing feature between *Furcraea gigantea* and *Furcraea gigantea* var. *Willemtiana Roem.*, or the " malgache " variety, which does not have a terminal thorn.

25. The leaves of *Furcraea gigantea* tend to be *glabrous* but they generally have a thin waxy coating particularly on plants growing in the open. The undersurface of a leaf usually has a rough feel due to fine

hairs protecting the stomata but under moist conditions the extent of this roughness may be confined to the convex " rib " or base of the central groove. A fine pinkish-brown line runs along the leaf edges, which is conspicuous on chlorotic plants, and at irregular intervals this tissue may develop highly lignified upward-pointing curved thorns. The " malgache " variety may also be distinguished from *furcraea* by the character of these marginal thorns. In the case of " malgache " the thorns are shorter (3·4 mm.) and less strongly curved while their bases conform with the outline of the leaf. With *furcraea* the sharply curved marginal thorns resemble cat's claws and each one is sited on a small pedestal of green tissue which results in the leaf edge having a wavy contour.

26. The occurrence of marginal thorns in *furcraea* is extremely variable both as regards numbers and location. On young plants they may be present along the entire margin, or in the lower and middle regions only, while on older plants they are less numerous and are commonly confined to the narrowest part of the leaf towards the butt. Heavily shaded plants have fewer and less well developed side thorns than unshaded plants. Completely spineless forms were absent. It is frequently supposed that this wide variation is attributable to genetical factors but this is probably incorrect because all the *furcraea* or " malgache " seen was similar in every other characteristic, and such differences as were observed could be accounted for by positional effects. In each variety the type of thorn was constant and it was only the arrangement on the leaf which was subject to considerable variation. Spiny and non-spiny forms are known in sisal and one explanation of these phenomena which has been put forward is that it may be a kind of chimera.

27. Embedded in each *furcraea* leaf are some 1,000-1,200 white tapering fibres of various lengths. Besides a single layer of peripheral or " mechanical " fibres which reinforce the leaf there is a distinct median line of fibres extending across the leaf from one edge to the other. This line may be situated within 1 cm. of the upper surface. These fibres protect conducting vessels and they run right through the leaf to the terminal point ; they correspond to the " ribbon " fibres of sisal. Scattered at random in the parenchyma are many other fibres. The majority of the fibres are nearly round in cross-section. The finer peripheral fibres in the chlorophyll-bearing epidermal tissue are difficult to isolate clearly.

28. *Furcraea gigantea* leaves are characterized by a single shallow groove running lengthwise. The leaves of " malgache," besides being a dark green, nearly always have minor furrows on either side of the main-groove, particularly at the tip end. The butt-end portion is usually except ionally fleshy and curves upwards in the lowest leaves. This is undesirable for decortication. " Malgache " often grows to enormous proportions and is seldom cut due to its low fibre percentage.

29. *Furcraea* produces a tall inflorescence or slender fibrous " pole " bearing cream to green flowers having a sweet scent. These flowers readily drop off after fertilization due to an abscission layer developing immediate-

ly below the ovary. Small *bulbous bulbils* then develop prolifically from the buds beneath the bracteoles of the flowering branches, and later their weight causes the pole to bend over in an arc (in agaves the pole is generally erect). Poling appears to be markedly seasonal in the drier parts of Mauritius, generally occurring after the rains. In due course the *bulbils* fall to the ground and thick clusters may take root. In contrast to sisal, offshoots develop freely in the axils of leaves on senescent plants.

30. *Furcraea* does not produce underground rhizomes as do agaves. It has a fibrous root system similar to sisal and the plant is usually firmly anchored in the ground.

## IV. DESCRIPTION OF PRODUCTION METHODS

### Field Methods

31. Access to the wild stands of *furcraea* is not always easy. Roads for leaf transport may be lacking or else have become overgrown as it is the practice to exploit the *furcraea* every two years or even less frequently. Therefore on some estates a preliminary operation is to open up roads or paths through the ticket for the passage of ox-carts which are commonly used for transporting the leaf. Sometimes it is necessary to cutlass the scrub or bush to enable the cutters to work. No maintenance work is carried out.

Cutting is usually done by small gangs of women labour, each under the charge of a sirdar or headman. The leaf is easy to cut with a small sharp sickle ; it is tied into bundles weighing about 7 kilos each which comprise 4-12 leaves depending upon the size of the leaf. These are roughly stacked near paths ready for sending to the fibre mill. The cutters generally work within a short distance of a track and they do not have to carry the leaf very far. They earn Re. 1.00 for 100 bundles or 700 kilos leaf.

As regards leaf transport, while ox-carts are suited to the uneven, stony and narrow tracks, they will only average from three to four trips daily, each of 600-800 kilos of leaf, when working within a mile from the factory. The largest estates use lorries and the quantity of leaf cut is checked on a weighbridge at the factory.

### Factory Methods

32. A fibre mill may comprise 4-10 raspadors driven by either a suction-gas engine or water power. Some estates have semi-automatic raspadors, each being of a different design. There are usually two " gratteurs " or operatives per raspador feeding leaves into the machines.

The raspador does not decorticate the fibre cleanly; water if not used fails to remove a large part of the leaf tissue ; the end result is really a limp leaf skeleton. This is known as " green fibre." Retting is necessary

before the fibre can be obtained in a reasonably clean condition and other labour, mostly women, is engaged on putting the green fibre into deep retting tanks full of water. Retting lasts for 5-6 days and some producers use either soap or a proprietary brand of a sulphonated batching oil to accelerate and improve the retting. The fibre is then washed in clean water and hung on single rope lines where it is left for two days to dry in the open. Discoloration of the fibre through exposure to the ultra-violet rays of the sun is an advantage for sack-making.

Up to this stage all tasks, including field work, are based upon the weight of fresh green fibre produced and the labour is paid accordingly although there are different rates for each class of work. The skilled "gratteur" is a key-man and consequently is the most highly paid worker. Since wages are based on green fibre weights, the producer naturally attaches great importance to the percentage of dry fibre obtained from the green fibre. This may vary from 15 to 17 per cent. and the figure is generally taken as an index of managerial efficiency because a low percentage may reflect slackness in the supervision of labour.

When the fibre is dry, all undecorticated portions of leaves or badly blemished fibres are cut off with scissors either on the drying lines or in the press shed. The dried fibre is then collected, bundled, weighed and pressed into bulky bales of 200 kilos each using a simple hand screw press. Each bale is fastened by three hand-made ropes. It is unnecessary to brush the fibre for the requirements of the sack factory. Preparation and packing of dry fibre is paid for on the basis of the number of bales produced.

Some idea of the efficacy of these extraction methods may be gained from the fact that the raw dry fibre contains 15-16 per cent. of "dust" or unremoved cortical tissue. Grading at the sack factory is dependent solely upon the cleanliness of the fibre and no other quality or defect is taken into account.

The foregoing descriptive account of the Mauritius hemp industry serves to show that the methods of production are primitive ; indeed they cannot be said to have advanced since the days when the raspador was first invented by a monk. In fairness to the hemp producer, however, it must be stated that many attempts have been made to improve upon the present system but so far without signal success.

*(to be concluded)*

# STATISTIQUES

## 1°. CLIMATOLOGIE

### (a) Pluviométrie (Pouces)

| Localités / Mois | Nord | | | | | | | Centre | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grand' Baie | Pamplemousses (Gardens | Pamplemousses (Normale) | Abercrombie | Abercrombie (Normale) | Ruisseau Rose | Belle Vue Maurel | Beau Bois (Moka) | Helvétia | Réduit | Réduit (Normale) | Curepipe | Curepipe (Normale) |
| Juillet 1948 | — | 2.20 | 2.93 | 1.17 | 1.82 | 3.36 | — | 5.87 | 7.62 | 3.57 | 2.75 | 11.96 | 8.57 |
| Août „ | — | 0.88 | 2.59 | 0.10 | 1.90 | 0.0 | — | 3.48 | 2.54 | 1.36 | 2.47 | 5.28 | 7.79 |

| Localités / Mois | Est | | | | Ouest | | | | | Sud | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Centre de Flacq | Camp de Masque | Palmar | G.R.S.E. | Port-Louis | Case Noyale | Beau-Bassin | Beau-Bassin (Normale) | Richelieu | Rose Belle | Riche-en-Eau | Camp Diable | Chemin Grenier |
| Juillet 1948 | 2.07 | 7.01 | 1.79 | 1.33 | 0.73 | 2.20 | 1.36 | 1.39 | 0.91 | 8.59 | — | 4.31 | 4.38 |
| Août „ | 2.38 | 3.99 | 1.10 | 1.46 | 0.51 | 1.46 | 0.15 | 1.13 | 0.10 | 8.33 | — | 4.26 | 4.32 |

### (b) Température °C

| Localités | Beau-Bassin | | Réduit | | | | Curepipe | | Richelieu | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mois | Max. | Min. | Max. | Min. | Moy. | Nor. | Max. | Min. | Max. | Min. |
| Juillet 1948 | 24.6 | 16.2 | 21.6 | 15.1 | 18.0 | 18.0 | 19.0 | 14.8 | 24.9 | 18.8 |
| Août „ | 24.7 | 15.9 | 22.1 | 14.7 | 18.1 | 17.9 | 18.4 | 13.9 | 25.0 | 18.4 |

### (c) Insolation

| Réduit | | |
|---|---|---|
| Mois | Heures de soleil | Fraction d'insolation |
| Juillet 1948 | 246.82 | 72.3 % |
| Août „ | 215.32 | 60.9 % |